The PHOTOFACT Servicer

November 1, 1950 ★ *Published for all users of Howard W. Sams' Photofact Folders* ★ Vol. 12, Nos. 111 & 112

"We all know a good thing the minute the other fellow sees it first." - Anon.

ANNOUNCEMENT

Walter R. Jones, associate professor of electrical engineering at Cornell University, has been retained as a member of our editorial staff.

Mr. Jones is research coordinator for the Cornell School of Electrical Engineering. He was formerly chief engineer of the radio division of Sylvania and engineer-in-charge of research and development of the Federal Radio Corporation.

I consider Walter R. Jones the top man in his line, with a background of experience in electronics which will enable him to bring to members of the Howard Sams Institute important data which will be extremely valuable.

Howard W. Sams

WE'LL PAY $5.00 FOR YOUR IDEAS ON NEW WAYS TO USE PHOTOFACT FOLDERS

Have you found some novel way of putting your PHOTOFACT Folders to work so you get extra value and help from them? Tell us about it, and if the idea is good enough to pass on to thousands of your fellow PHOTOFACT subscribers, we'll print it in the "Servicer" and send you a crisp $5.00 check. Here's one practical suggestion we've received that was well worth $5.00:

"I take this opportunity to tell you how much I like Photofacts. They are tops. To keep them in order I cut off about one inch of the top of the envelope - to expose the numbered index tab. I leave all the folders in the envelope. When I want a folder I just take out the set and find my folder. When I am through I put the folder in the set and file set in its proper place."

F. H. Burns
Bondurant, Iowa

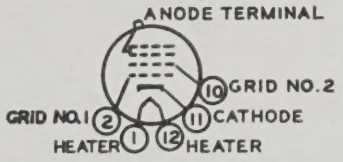
PICTURE TUBE INFORMATION

The following three pages contain what we feel is some of the most worth-while information recently released.

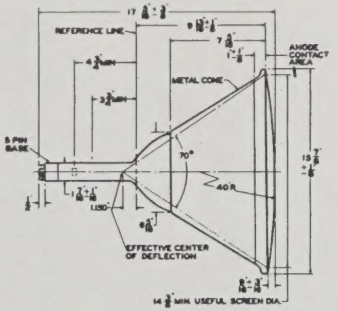
Undoubtedly everyone of you has been asked in the past few months to convert some existing television receiver to one of the more popular tube sizes or to replace a picture tube used in an early model receiver with one of the new and widely produced picture tubes. With the information reprinted here by permission of the Rauland Corporation, you should be able to point out to your customers the difference in the various picture tube types and to satisfy yourself as to the various picture tube types available and their characteristics.

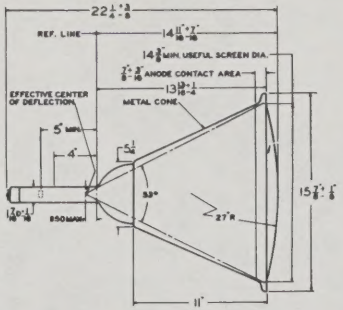
Should you have any further questions, we suggest that you direct them to the Rauland Corporation, 4245 West Knox Avenue, Chicago 41, Illinois.

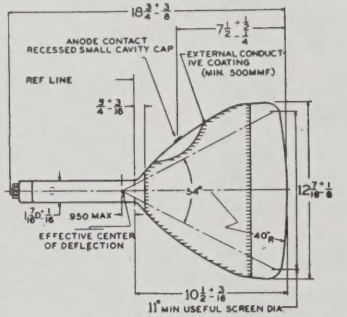
BASIC TUBE DIMENSIONS

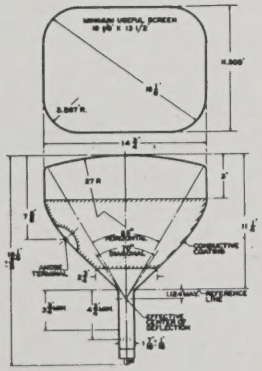


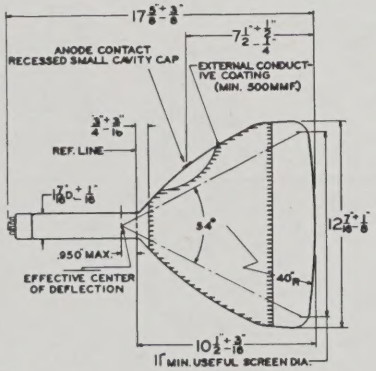
BASE CONNECTIONS

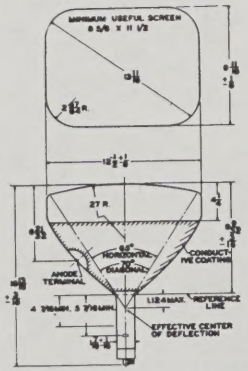


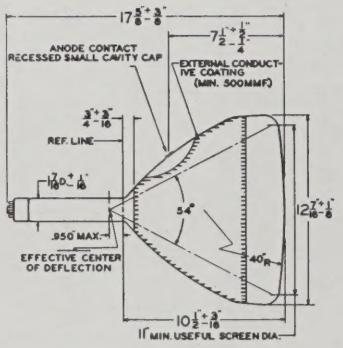


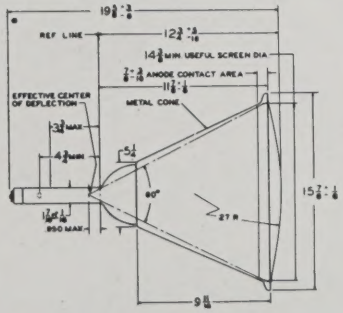


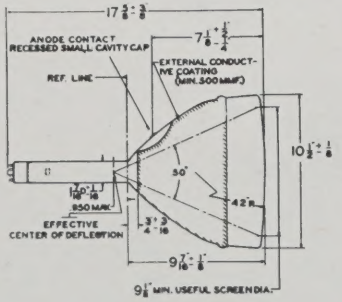


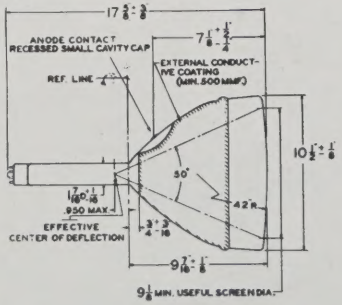


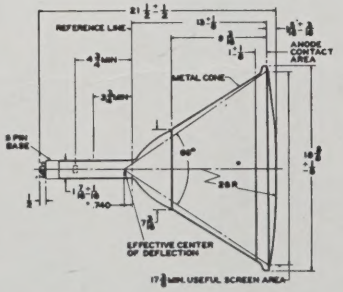












FIELD EXPERIENCES -

For every "Field Experience" published, we issue a certificate good for one PHOTOFACT Folder Set. Awards are issued at the time of publication. Since it is impossible to verify the accuracy of contributions, we cannot be responsible for either the diagnosis made of the receiver trouble, or the results which will be obtained by following the suggested repair routine. All contributions become the property of Howard W. Sams & Co., Inc.

GENERAL ELECTRIC Models 817, 818 and 821
Photofact Set No. 78, Folder No. 7

Complaint: Severe hum in audio output, which was not a buzz, such as is caused by the intercarrier system used in this series of receivers.

Cause: After checking voltages, tubes and suspected condensers, I disconnected the isolation resistor R-110 and the interference trap L-2, which are from B- to chassis, and measured the resistance between B- and chassis, which was low. Since several tubular electrolytic capacitors are employed in these receivers, I suspected that one or more of them were leaking to chassis.

Remedy: I removed each capacitor and carefully placed heavily insulated fibre around each capacitor, remounted, checked the resistance and got an "infinity" reading of about 100 megohms.

Replacing the R-110 and L-2 units to their respective points, I turned on the receiver, and everything was okay from the audio output.

Other points to look for in this series of receivers:

The R-371, 5-ohm resistor opening, causing the complete loss of B voltage to the resistor. Replace with a 5-watt, 5-ohm resistor.

The 6AL5 Pin No. 6 on V-22 is used as a tie point between the R-296 resistor and the lead going to the vertical size control. Pin No. 6 on the 6AL5 is an "internal shield," and this tie point should be disconnected in case of internal trouble developing in V-22.

"Smearing" in these receivers is caused by an opened L-257 in the plate circuit of V-8b, which is a frequency-compensating shunt choke. No control of horizontal size will be caused by L-314 becoming open. Normal resistance of this control is approximately 45 ohms.

On the 818 combination model of this series, the TV chassis can be operated on the work bench by shorting terminals No. 8 (brown) and No. 7 (black) of the female plug.

Editor's note: All above experiences submitted by:

Horace D. Westbrooks
117 W. Solomon Street
Griffin, Georgia

* * *

PHILCO Model 49-500, Code 121
Photofact Set No. 48, Folder No. 19

Complaint: Set had low volume.

Remedy: Checked the 14B6 plate resistor, Item No. 24. This resistor had changed value from 470,000 ohms to 9 megohms. If the tubes do not light up, check the 50A5. It frequently goes out. If faulty, replace.

Warren W. Waters
604 Main Street
Covington 3, Kentucky

* * *

SENTINEL Models 412, 413, 414, 415
Photofact Set No. 100, Folder No. 11

Complaint: Arcing in high voltage power supply.

Cause: The arcing is originating from the horizontal output transformer and upon close inspection it will be noted that there is an arcing from the 1X2 filament winding to the core of the transformer.

Remedy: Clip the leads of the filament winding from the pin socket, using a piece of plastic coated stranded hookup wire approximately one inch longer than the original length of wire, feed this through the insulating blocks and dress it away from the coil. It might be necessary to remove the insulating blocks holding the winding and enlarge the holes which hold it to the core, in order that the winding will be dressed away from the coil. The ends of the windings should then be replaced.

Editor's Note: Additional polyethylene sheet insulation will many times stop high voltage breakdown in these windings. (A good source for this material is the plastic cone provided for a 16" metal tube.)

J. J. Honeycutt
G. & H. Radio
3322 N. Halstead Street Chicago 13, Illinois

ELECTROMAGNETIC TYPE TV PICTURE TUBES

Type	Defl. Angle	Screen Min. use Diam.	Overall Length	Maximum Bulb Diam.	Neck Length	Jetec Refer. Line Guage	Contact	Focus Coil: Current MA	Focus Coil: Jetec No.	Ion Trap Field	Maximum Anode KV Ratings	Outer Coating Cap. MMF. Max.	Typical Oper. Cond.: KV	Typical Oper. Cond.: Grid #2	Typical Oper. Cond.: Grid #1	Type
10BP4																**10BP4**
10BP4A*	**52**	**9 1/2**	**17 5/8**	**10 1/2**	**8 3/8**	**112**	**Cav.**	**100**	**106**	**Double**	**10**	**1250**	**9**	**250**	**—45**	**10BP4A***
10CP4	52	9 1/2	16 5/8	10 1/2	7 3/8	112	Ball	100	106	None	11	500	8	250	—45	10CP4
10EP4	52	9 1/2	17 5/8	10 1/2	8 3/8	112	Ball	110	106	Double	12	None	9	250	—45	10EP4
10FP4*	**52**	**9 1/2**	**17 5/8**	**10 1/2**	**8 3/8**	**112**	**Cav.**	**110**	**106**	**None**	**10**	**1250**	**9**	**250**	**—45**	**10FP4***
10MP4																10MP4
10MP4A	52	9 1/2	17	10 1/2	7 3/8	112	Cav.	110	106	Double	10	1250	9	.....	—45	10MP4A
12JP4	56	11	17 1/2	12	7	112	Ball	146	106	None	12	None	10	250	—45	12JP4
12KP4																**12KP4**
12KP4A*	**54**	**11 1/4**	**17 5/8**	**12 1/8**	**7 1/2**	**112**	**Cav.**	**135**	**106**	**None**	**12**	**1500**	**11**	**250**	**—45**	**12KP4A***
12LP4																**12LP4**
12LP4A*	**54**	**11 1/4**	**18 3/4**	**12 1/8**	**8 1/4**	**112**	**Cav.**	**130**	**106**	**Double**	**12**	**1500**	**11**	**250**	**—45**	**12LP4A***
12QP4																12QP4
12QP4A	55	11	17 1/2	12 1/8	7	112	Ball	135	106	Single	12	None	10	250	—45	12QP4A
12RP4	56	11	17 1/2	12	7	112	Ball	135	106	Single	12	None	10	250	—45	12RP4
12TP4	54	11 1/4	18 3/4	12 1/8	8 1/4	112	Cav.	135	106	Double	12	None	11	250	—45	12TP4
12UP4																**12UP4**
12UP4A*	**54**	**11 3/8**	**18 5/8**	**12 1/8**	**8**	**112**	**cone**	**130**	**106**	**Double**	**12**	**None**	**11**	**250**	**—45**	**12UP4A***
12UP4B																**12UP4B**
12VP4																12VP4
12VP4A	55	11 1/4	18	12 1/8	7 1/2	112	Cav.	130	106	Double	12	1500	11	.....	—55	12VP4A
15AP4	57	14	20 1/2	15 1/2	6 7/8	112	Ball	159	106	None	15	None	12	250	—45	15AP4
15CP4	50	14	21 1/2	15 1/2	8	112	Cav.	115	106	Double	15	None	12	250	—45	15CP4
15DP4	57	14	20 1/2	15 1/2	6 3/8	112	Ball	140	106	Single	15	None	12	250	—45	15DP4
16AP4																**16AP4**
16AP4A*	**53**	**14 3/8**	**21 5/8**	**15 7/8**	**7 5/8**	**112**	**cone**	**80**	**109**	**Double**	**14**	**None**	**12**	**300**	**—55**	**16AP4A***
16AP4B																**16AP4B**
16CP4	52	15	21 1/2	15 7/8	6 5/8	112	Cav.	100	106	Double	15	None	12	300	—55	16CP4
16DP4																16DP4
16DP4A	60	14 1/2	20 3/4	15 7/8	7 7/8	112	Cav.	115	106	Double	15	None	12	250	—45	16DP4A
16EP4																**16EP4**
16EP4A*	**60**	**14 3/8**	**19 5/8**	**15 7/8**	**6 7/8**	**112**	**cone**	**105**	**109**	**Double**	**14**	**None**	**12**	**300**	**—55**	**16EP4A***
16EP4B																**16EP4B**
16FP4	62	15	20 3/4	16 1/8	7	112	Ball	146	106	Single	16	None	13	250	—45	16FP4
16GP4*																**16GP4***
16GP4B	**70**	**14 5/8**	**17 3/8**	**15 7/8**	**6 1/2**	**110**	**cone**	**100**	**109**	**Single**	**14**	**None**	**12**	**300**	**—55**	**16GP4B**
16HP4																16HP4
16HP4A	60	14 1/2	21 1/4	15 7/8	8 3/8	112	Cav.	110	106	Double	14	2000	12	300	—55	16HP4A
16JP4																16JP4
16JP4A	60	15	20 3/4	16 1/8	7 1/2	112	Cav.	115	106	Double	14	1500	11	250	—45	16JP4A
16LP4																16LP4
16LP4A	52	14 1/2	22 1/4	15 7/8	7 5/8	112	Cav.	110	106	Double	14	2000	12	300	—55	16LP4A
16MP4																16MP4
16MP4A	60	14 3/4	21 3/4	16 1/8	8 1/2	112	Cav.	110	106	Double	14	2000	12	300	—55	16MP4A
16SP4																16SP4
16SP4A	70	14 1/2	17 3/8	15 7/8	7	110	Cav.	110	109	Double	14	2000	12	300	—55	16SP4A
16VP4	70	14 1/2	17 3/8	15 7/8	6 7/8	110	Cav.	110	109	Single	15	None	12	250	—45	16VP4
16WP4	70	14 1/2	17 3/4	15 7/8	7 1/2	110	Cav.	110	109	Double	15	None	12	250	—45	16WP4
16YP4	70	14 1/2	17 5/8	15 7/8	7	110	Cav.	100	109	Single	14	1500	12	300	—55	16YP4
19AP4																**19AP4**
19AP4A*	**66**	**17 3/8**	**21 1/2**	**18 5/8**	**7 1/2**	**112**	**cone**	**146**	**106**	**Single**	**19**	**None**	**13**	**250**	**—45**	**19AP4A***
19AP4B																**19AP4B**
19DP4																19DP4
19DP4A	66	17 3/8	21 1/2	18 7/8	7 1/4	112	Cav.	146	106	Single	19	3000	13	250	—45	19DP4A
19FP4	66	17 5/8	22	18 7/8	7 5/8	112	Cav.	115	109	Double	19	None	13	250	—45	19FP4
19GP4	66	17 5/8	21 3/4	18 7/8	6 7/8	112	Cav.	115	109	Single	19	None	13	250	—45	19GP4
20BP4	54	18 3/4	28	20	8 3/4	Spec	Cap	122	106	None	20	None	12	300	—55	20BP4
22AP4																**22AP4**
22AP4A*	**70**	**20 1/4**	**22 3/8**	**21 5/8**	**7 1/4**	**110**	**cone**	**117**	**109**	**Single**	**19**	**None**	**14**	**300**	**—55**	**22AP4A***
22AP4B																**22AP4B**
14" RECTANGULARS																
14BP4*	**70 Diag.**	**8 5/16 x 11 1/2**	**16 3/4**	**13 5/8**	**7 1/2**	**110**	**Cav.**	**110**	**109**	**Single**	**14**	**1500**	**12**	**300**	**—55**	**14BP4***
14CP4	70 Diag.	8 5/16 x 11 1/2	16 3/4	13 5/8	7 1/2	110	Cav.	115	109	Single	14	1500	12	300	—55	14CP4
14DP4	70 Diag.	8 5/16 x 11 1/2	16 3/4	13 5/8	7 1/2	110	Cav.	115	109	Double	14	None	12	300	—55	14DP4
16" RECTANGULARS																
16KP4	70 Diag.	10 1/16 x 13 1/2	18 3/4	16 1/16	7 1/2	110	Cav.	90	109	Single	16	1500	14	300	—55	16KP4
16QP4	70 Diag.	10 1/16 x 13 1/2	19 1/2	16 1/16	7 7/8	110	Cav.	150	106	Double	16	None	14	250	—45	16QP4
16RP4	70 Diag.	10 1/16 x 13 1/2	18 3/4	16 1/16	7 1/2	110	Cav.	100	109	Single	16	1500	12	300	—55	16RP4
16TP4*	**70 Diag.**	**10 1/16 x 13 1/2**	**18 1/2**	**16 1/16**	**6 7/8**	**110**	**Cav.**	**115**	**109**	**Single**	**14**	**1500**	**12**	**300**	**—55**	**16TP4**
16XP4	70 Diag.	10 1/16 x 13 1/2	18 3/4	16 1/16	7 1/2	110	Cav.	100	109	Double	15	None	12	250	—45	16XP4
16UP4	70 Diag.	10 3/16 x 13 3/16	18 1/2	16 1/16	6 7/8	110	Cav.	100	109	Single	15	None	12	300	—55	16UP4
17" RECTANGULARS																
17BP4A*	**70 Diag.**	**10 3/4 x 14 1/4**	**19 1/4**	**16 5/8**	**7 5/8**	**110**	**Cav.**	**100**	**109**	**Single**	**16**	**2000**	**12**	**300**	**—55**	**17BP4A***
17AP4	70 Diag.	10 3/4 x 14 1/4	18 5/8	16 5/8	6 7/8	110	Cav.	100	109	Single	16	2000	12	300	—55	17AP4

C R TUBE INTERCHANGEABILITY

Type	If Sub. By	Diff. in Dia. is	Diff. in Length + or —	Diff. in Anode Contact	Diff. in Original Ion Trap	Add Cap. to Hi-Vol.	Typical Anode (E) is Diff.	Focus (I) is Diff.	Type has Cond. Coating	Metal Cone Tie Cont. to End
10BP4	10CP4	.....	—1"	X	X	.....	.....	X	.....	.....
10BP4A	10EP4	.....	.....	X	.....	.....	.....	.....	.....	.....
.....	10FP4	.....	.....	.....	X	.....	.....	.....	.....	.....
.....	10MP4	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	10MP4A	.....	—⅜"	.....	.....	.....	.....	X	.....	.....
.....	10BP4	.....	.....	.....	.....	.....	.....	.....	.....	.....
10FP4	10BP4A	.....	.....	.....	X	.....	.....	.....	.....	.....
.....	10CP4	.....	—1"	X	.....	.....	.....	X	.....	.....
.....	10EP4	.....	.....	X	X	.....	.....	.....	.....	.....
.....	10MP4	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	10MP4A	.....	—⅜"	.....	X	.....	.....	X	.....	.....
12KP4	12JP4	—⅜"	—⅛"	X	.....	.....	.....	X	.....	.....
12KP4A	12LP4	.....	+1 3/16"	.....	X	.....	.....	X	.....	.....
.....	12LP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	12QP4	.....	—⅛"	X	X	.....	.....	.....	.....	.....
.....	12QP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	12RP4	—⅜"	—⅛"	X	X	.....	.....	X	.....	.....
.....	12TP4	.....	+1 3/16"	.....	X	.....	.....	X	.....	.....
.....	12UP4	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	12UP4A	.....	+1"	X	X	X	.....	X	.....	X
.....	12UPVB	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	12VPU	.....	+⅜"	.....	X	.....	.....	X	.....	.....
.....	12VP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
12LP4	12JP4	—⅜"	—1 3/16"	X	None	.....	.....	X	.....	.....
12LP4A	12KP4	.....	—1 3/16"	.....	X	.....	.....	X	.....	.....
.....	12KP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	12QP4	.....	—1 3/16"	X	None	.....	.....	X	.....	.....
.....	12QP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	12RP4	—⅜"	—1 3/16"	X	X	.....	.....	X	.....	.....
.....	12TP4	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	12UP4	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	12UP4A	.....	—⅜"	X	.....	X	.....	.....	.....	X
.....	12UP4B	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	12VP4	.....	—¼"	.....	.....	.....	.....	X	.....	.....
.....	12VP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
12UP4	12JP4	—1 3/16"	—1 3/16"	X	None	.....	.....	.....	X	.....
12UP4A	12KP4	.....	—1"	X	None	.....	.....	.....	X	.....
12UP4B	12KP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	12LP4	.....	+1 3/16"	X	.....	.....	.....	.....	X	.....
.....	12LP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	12QP4	.....	—1 3/16"	X	X	.....	.....	.....	X	.....
.....	12QP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	12RP4	—1 3/16"	—1 3/16"	X	X	.....	.....	.....	X	.....
.....	12TP4	.....	+1 3/16"	X	.....	.....	.....	.....	X	.....
.....	12VP4	.....	—⅜"	X	.....	.....	.....	.....	X	.....
.....	12VP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
16AP4	16CP4	.....	—¾"	X	.....	.....	.....	X	X	.....
16AP4A	16DP4	.....	—1 1/16"	X	.....	.....	.....	X	X	.....
16PP4B	16DP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16EP4	.....	—2 3/16"	.....	X	.....	.....	X	.....	.....
.....	16EP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16EP4B	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16FP4	+¼"	—⅝"	X	X	.....	X	X	X	.....
.....	16GP4	.....	—4 5/16"	.....	X	X	.....	X	.....	.....
.....	16GP4B	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16HP4	.....	—⅜"	X	.....	.....	.....	X	X	.....
.....	16HP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16JP4	+¼"	—1 1/16"	X	.....	.....	X	X	X	.....
.....	16JP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16LP4	.....	.....	X	.....	.....	.....	X	.....	.....
.....	16LP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16MP4	.....	—⅛"	X	.....	.....	.....	.....	X	X
.....	16MP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16SP4	.....	—4 5/16"	X	.....	.....	.....	.....	X	.....
.....	16SP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16VP4	.....	—2 3/16"	X	X	.....	.....	X	X	.....
.....	16WP4	.....	—1 7/16"	X	.....	.....	.....	X	X	.....
.....	16YP4	.....	—2 5/16"	X	X	.....	.....	X	X	.....
16GP4	16AP4	.....	+4 3/16"	.....	X	X	.....	X	.....	.....
16GP4B	16AP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16AP4B	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16CP4	.....	+4 3/16"	X	X	.....	.....	.....	X	.....
.....	16DP4	.....	+3 7/16"	X	X	.....	.....	X	X	.....
.....	16DP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16EP4	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16EP4A	.....	+2 3/16"	.....	X	X	.....	X	.....	.....
.....	16EP4B	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16FP4	+¼"	+2 5/16"	X	.....	.....	X	.....	X	.....
.....	16HP4	.....	+3 5/16"	X	X	.....	.....	X	X	.....
.....	16AP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16JP4	+¼"	+3 7/16"	X	X	.....	X	X	X	.....
.....	16JP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16LP4	.....	+4 5/16"	X	X	.....	.....	.....	X	.....
.....	16LP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16MP4	+¼"	+4 7/16"	X	X	.....	.....	.....	X	.....
.....	16MP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16SP4	.....	.....	X	X	.....	.....	.....	X	.....
.....	16SP4A	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	16YP4	.....	—⅛"	X	.....	.....	.....	.....	X	.....
.....	16WP4	.....	+1/8"	X	X	.....	.....	.....	X	.....
.....	16YP4	.....	.....	X	X	.....	.....	.....	X	.....
19AP4	19DP4	.....	.....	X	.....	.....	.....	.....	.....	.....
19AP4A	19DP4A	+⅛"	.....	.....	.....	.....	.....	.....	X	.....
19AP4B	19FP4	+⅛"	+1/2"	X	X	X	.....	X	X	.....
.....	19GP4	+¼"	—¼"	X	.....	X	.....	X	X	.....
14BP4	14CP4	.....	.....	.....	.....	.....	.....	X	.....	.....
.....	14DP4	.....	.....	.....	X	X	.....	X	.....	.....
16TP4	16KP4	.....	+5/8"	.....	.....	.....	X	X	.....	.....
.....	16QP4	.....	+1"	.....	X	X	X	X	.....	.....
.....	16RP4	.....	+5/8"	.....	.....	.....	.....	X	.....	.....
.....	16XP4	.....	+5/8"	.....	X	X	.....	X	.....	.....
.....	16UP4	.....	.....	.....	.....	X	.....	X	.....	.....
17BP4A	17AP4	.....	—5/8"	.....	.....	.....	.....	.....	.....	.....

NOTES

1. Heater: Vol. 6.3 AC or DC Current 0.6 AMPS.
2. Focusing: Electromagnetic
3. Deflection: Electromagnetic
4. Screen Phosphor P4: Persistence Med.
5. Mounting: Any position
6. Connecting Socket should not be rigidly mounted but wired with flex. wire leads to allow free movement.
7. It is recommended that the contact to the conductive coating of glass tubes be made in not less than 3 places so as to obtain maximum capacity.
8. It is recommended that the cathode be returned to one side or to the mid tap of the heater transformer winding.
9. Brightness is reduced by lowered anode vol. For maximum light output anode vol. should not be less than REC. value.
10. Tubes with asterisk (*) have Rauland Luxide Screen (Black Face). This increases contrast and improves definition by absorbing a considerable percentage of the ambient light traveling to the screen. Halation which usually detracts from contrast and definition is also diminished to a marked extent.
11. Tubes with suffix (B) have Rauland Luxide Screen, plus new etched face-plate, so treated that specular reflection from it is practically eliminated.
12. Basing — 12D
13. When a high focus current tube is replaced by a low focus current tube, it may be necessary to increase the focus current range of the receiver or change the focus coil.
14. If a tube without external coating is replaced for a tube with external coating, a 500 to 1500 mmf capacitor connected between the Hi-Voltage output lead and ground will insure proper operation.
15. Tubes in Bold Face are manufactured by Rauland and have the exclusive Indicator Ion Trap adjustment features, plus the new Tilted Offset Gun.

FIRESTONE Models 4-A-63, 4-A-64, 4-A-65
Photofact Set No. 67, Folder No. 10,
and Set No. 68, Folder No. 9

Complaint: Oscillation noise when set is first turned on. This noise seems to go away when the receiver is warmed up. However, the oscillator frequency is not stable. This condition also causes the receiver to be very weak and the selectivity poor.

Cause: The abnormal decrease of mutual conductance value of the 12AT7 causes the condition explained above.

Remedy: Replace the 12AT7 tube. Replace the plate mixer decoupling resistor marked as R6 in the schematic of these models in Howard W. Sams Photofacts. R6, which is a 1000 ohm half watt resistor, should be changed to a 4700 ohm half watt resistor. I have used this remedy and have found it to cure the complaint above. The suggested change of R6 gives better decoupling and maintains a more stable oscillator.

Charles W. Niedermyer
Charlies' Radio Service
Moundsville, W. Va.

* * *

PHILCO Model 50-1423
Philco Set No. 97, Folder No. 11

Complaint: Frequent burning out of 50Y7GT rectifier tube and pilot light (No. 44).

Cause: Check voltage doubler capacitor, 20 MFD, 150 volts for low value. This capacitor will often check only 8 or 9 MFD. (Philco Part No. 30-2568-22. C1 on Photofact.)

Remedy: Replace defective part.

PHILCO Model 50-1423
Photofact Set No. 97, Folder No. 11

Complaint: Set works okay except that volume control will not change the volume.

Cause: Connections bad between pins No. 2 and 3 of 6AQ6.

Remedy: Resolder and this will cure the trouble.

Editor's Note: Both above experiences submitted by:

D. A. Duquet
Radio & Electrical Appliance Service
10 Monument Street
Waterville, Maine

BUICK Model 980690
Photofact Set No. 18, Folder No. 9

Complaint: Set would cut off while in car, but when on service bench it worked okay. Aerial and installation of set when in car were okay.

Cause: When set was mounted in car, a slight twist or strain was encountered due to the set mounting brackets being out of line, thus causing a pull or twist on the set cabinet or case, which in turn opened the ground lead from the antenna choke coil (Item No. 51 in Photofacts, Buick Part No. 2240251), to ground.

Remedy: Replace short bus-lead with a longer piece that will permit grounding of coil without any strain on terminal of coil.

Alvin E. Nagle
Nagle's Radio Service
622 Columbia Avenue
Lancaster, Pennsylvania

* * *

HALLICRAFTERS 700 Series

Complaint: Hum on sound more pronounced when on station. Picture okay. Sometimes sound is noisy or intermittent.

Cause and Remedy: Spent some time checking filters and replacing tubes. Found shorted ratio detector coil primary to secondary short. Replaced coil and set was okay. I came across a number of these sets with the same complaint.

HALLICRAFTERS 700 Series

Complaint: Set smokes - smells like shorted power transformer.

Cause and Remedy: Found shorted .035 MFD 600 volt capacitor in flyback circuit. This capacitor can be located under chassis between lug of width coil and ground. Replace with .035 MFD 1000 volt.

HALLICRAFTERS 800 Series

Complaint: Cannot center picture on screen.

Cause and Remedy: These models come with a centering control, adjustable from back top of set. Centering control bent out of shape due to shipping. Bend control until picture is centered.

Editor's Note: All three above experiences were submitted by:

Max Kellman
TV Service Technician
306 Garfield Place Brooklyn 15, New York

SUPPLEMENTAL DATA TO FOLDER 4 SET 103

CO-VK16 (Late), C-VK19

Model C-VK19 and late production of Model CO-VK16 are identical to model CO-VK16 covered in Photofact Folder 4, Set 103 except for the following changes:

The early production of Model CO-VK16 employed an RF type high voltage power supply. Later production used a flyback system. A partial schematic covering this change is shown on the reverse side. A list of the minor changes and a partial parts list of components that have been added or whose values have changed is given below:

L30 is connected to the middle lug of the terminal strip instead of the bottom lug.
A 68Ω resistor R159 is added from the low side of L4 to chassis.
A 10Ω resistor R160 is added between pin 1 and 2 of V1.
C18 is connected to pin 2 of V1.
R20 is connected to pin 1 of V1.
A 1500MMF capacitor C120 is added from the low side of R23 to chassis.
Pin 2 of V2 is connected to chassis.
C32 is connected between the screen of V5 and chassis instead of cathode.
A 1KΩ resistor R161is connected in series with R44 and B+.
A 100KΩ resistor is added in series with pin 7 of V10 and R57.
An 820Ω resistor is added in series with R64 and chassis.
The low side of R47 is connected to the junction of R64 and the 820Ω resistor R164 added in series with R64.
A filament choke is added from pin 4 of V1 to the 6.3 volt line.
Two filament chokes in parallel are added from pin 3 of V1 to chassis.
The picture tube used in Model C-VK19 is a 19AP4 (V30C).

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: ANDREA PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	NOTES
V2A	Converter	6AG5	6AG5	7BD	
B	Converter	6AK5	6AK5	7BD	
V25	Not used				
V26	Not used				
V27	Not used				
V30C	Picture Tube	19AP4	19AP4	12D	
V31	Hor. Disch.	6SN7GT	6SN7GT	8BD	
V32	Hor. Output	6BG6G	6BG6G	8BD	
V33	Damper	6W4GT	6W4GT	5BT	
V34	HV Rect.	1B3GT	1B3GT	3C	
V35	HV Rect.	1B3GT	1B3GT	3C	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA: ANDREA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.
C9	Not used							
C14	Not used							
C15	Not used							
C31	5000			BPD-005	DD-502	1D5D5	811-005	29C1
C36	5000			BPD-005	DD-502	1D5D5	811-005	29C1
C73	300	2000						
C97	Not used							
C100	Not used							
C101	Not used							
C102	Not used							
C103	Not used							
C104	Not used							
C105	Not used							
C106	Not used							
C107	Not used							
C110	100	25		PRS25/100		BRH25LA		TVA-1207
C111	500	1000		1469-HV-0005				
C112	.01	600		P688-01	D6-103	PTE6S1	811-01	6TM-S1
C113	1.0	100		484-1.0		GT2W1		2TM-M1
C114	.1	600		P688-1	DF-104	PTE6P1		6TM-P1
C115	150	2000						
C116	.25	400		P488-25		GT4P25		4TM-P25
C117	.15	200		P288-15		GT4P2		2TM-P15
C118	500	10KV						
C119	500	10KV						
C120	1500			SI1500	D6-152	1W5D15	GP2L-0015	29C8

MISCELLANEOUS

ITEM No.	PART NAME	ANDREA PART No.	NOTES
M6A	Ion Trap	FM-5164	Used in CO-VK16
B	Ion Trap	FM-5187	Used in C-VK19
M12	Not used		

CONTINUED ON REVERSE SIDE

ANDREA MODELS
CO-VK16, C-VK19

PRODUCTION CHANGES
BULLETIN 8

PRODUCTION CHANGES
BULLETIN 8

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CONTROLS

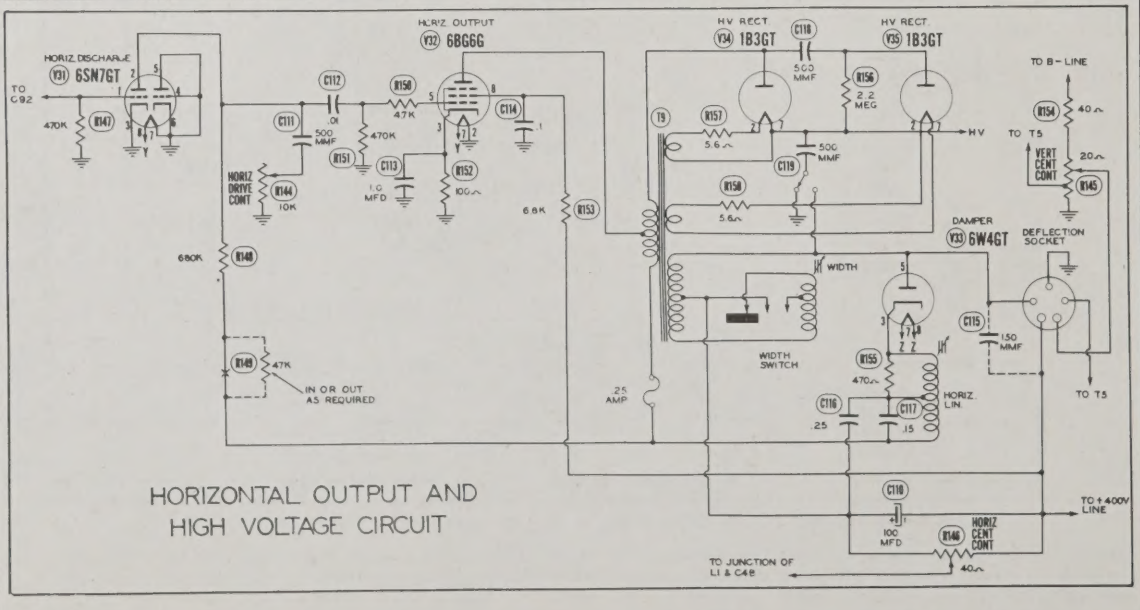
ITEM No.	RATING		REPLACEMENT DATA				INSTALLATION NOTES
	RESISTANCE	WATTS	ANDREA PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	
R13	Not used						
R14	Not used						
R15	Not used						
R16	Not used						
R144A	10KΩ	½	GRV-828	Q11-116	AG-27-S	AN-14	Horiz. drive control
B	Shaft		Not Req.	RQ	FKS-1/4	AK-1	Attach to R144A per instructions
R145	20Ω	2	GRV-810-1	W-20 x 10 ‡	43-20 CT ‡	SVT-901	Vert. centering control, tapped at 10Ω-Wire Wound
R146	40Ω	2	GRV-823	W-40 ‡	43-40 ‡	V-114 ‡	Horiz. centering control-Wire Wound

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		IDENTIFICATION CODES
	RESISTANCE	WATTS	ANDREA PART No.	IRC PART No.	
R19	Not used				
R43	560Ω	½		BTS-560	
R61	3.3KΩ	½		BTS-3300	
R64	680Ω	½		BTS-680	
R125	6.8KΩ	2		BTB-6800	
R126	Not used				
R127	Not used				
R128	Not used				
R130	Not used				
R131	Not used				
R132	Not used				
R147	470KΩ	½	GRC-228	BTS-470K	
R148	680KΩ	½	GRC-295	BTS-680K	
R149	47KΩ	½	GRC-207	BTS-47K	
R150	4.7KΩ	½	GRC-205		
R151	470KΩ	½	GRC-228	BTS-470K	
R152	100Ω	½	GRC-235	BTS-100	
R153	6.8KΩ	2	GRC-257	BTB-6800	
R154	40Ω	5	GRW-525	1 3/4A-40	
R155	470Ω	½	GRC-213	BTS-470	
R156	2.2 Meg.	5	GRW-527		
R157	5.6Ω	½	GRC-293		
R158	5.6Ω	½	GRC-293		
R159	68Ω	½			
R160	10Ω	½			
R161	1000Ω	½			
R162	100KΩ	½		BTS-100K	
R163	820Ω	½		BTS-820	

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING DC RESISTANCE		REPLACEMENT DATA				NOTES
	PRI.	SEC.	ANDREA PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
T4	Not used						
T8	Not used						
T9	120Ω	7.5Ω	ST-3027				Hor. Output Trans.
	Tap ⓐ	Tap ⓐ					
	75Ω	.5Ω					
		SEC. 2					
		0Ω					
		SEC. 3					
		0Ω					



HORIZONTAL OUTPUT AND HIGH VOLTAGE CIRCUIT

PHOTOFACT* Folder

CAPEHART MODELS
323M (CH. CX-33F), 324M, 325F, 3011B, M, 3012B, M (CH. CX-33)

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MODEL 3012M

CAPEHART MODELS
323M (CH. CX-33F), 324M, 325F, 3011B, M, 3012B, M (CH. CX-33)

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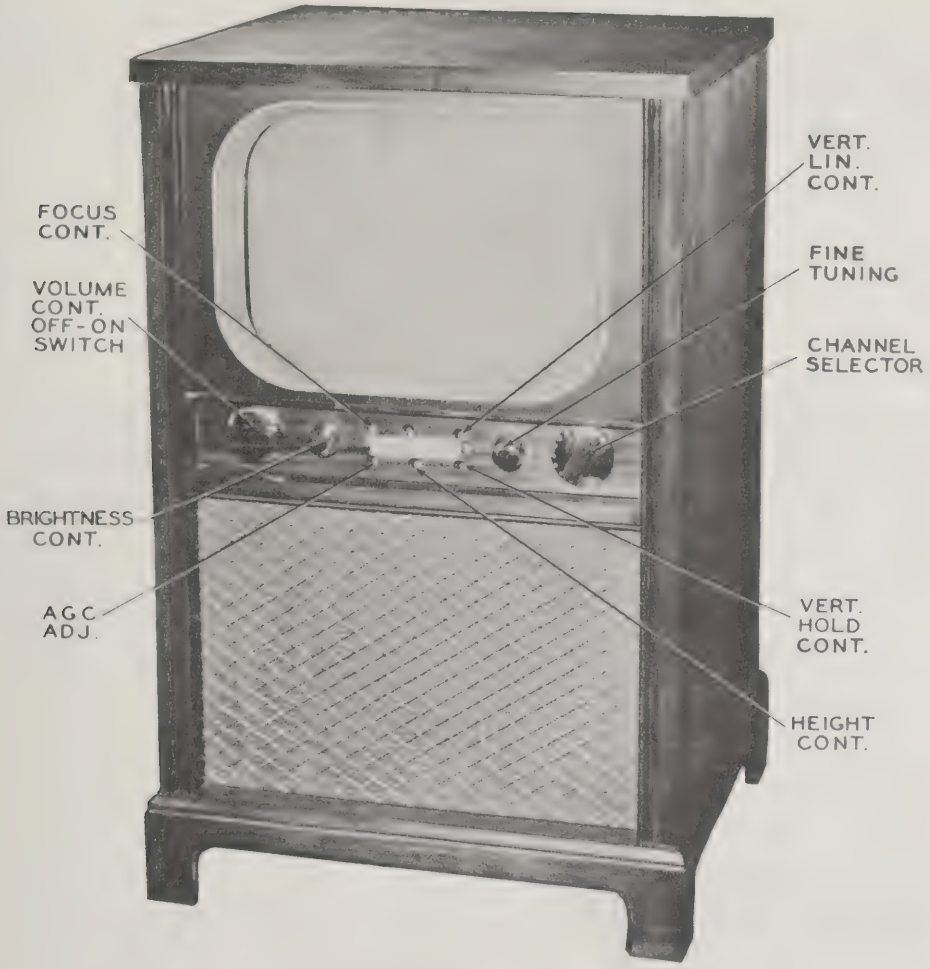

CAPEHART MODEL 3012

TRADE NAME	Capehart, Models 323M (Ch. CX-33F), 324M, 325F, 3011B, M, 3012B, M (Ch. CX-33)
MANUFACTURER	Capehart - Farnsworth Corp., Fort Wayne (1), Indiana
TYPE SET	Television Receiver
TUBES	Twenty Four
POWER SUPPLY	110 - 120 Volts AC - 60 cycles
RATING	2.4 Amp. at 117 Volts AC
TUNING RANGE-	Channels 2 thru 13

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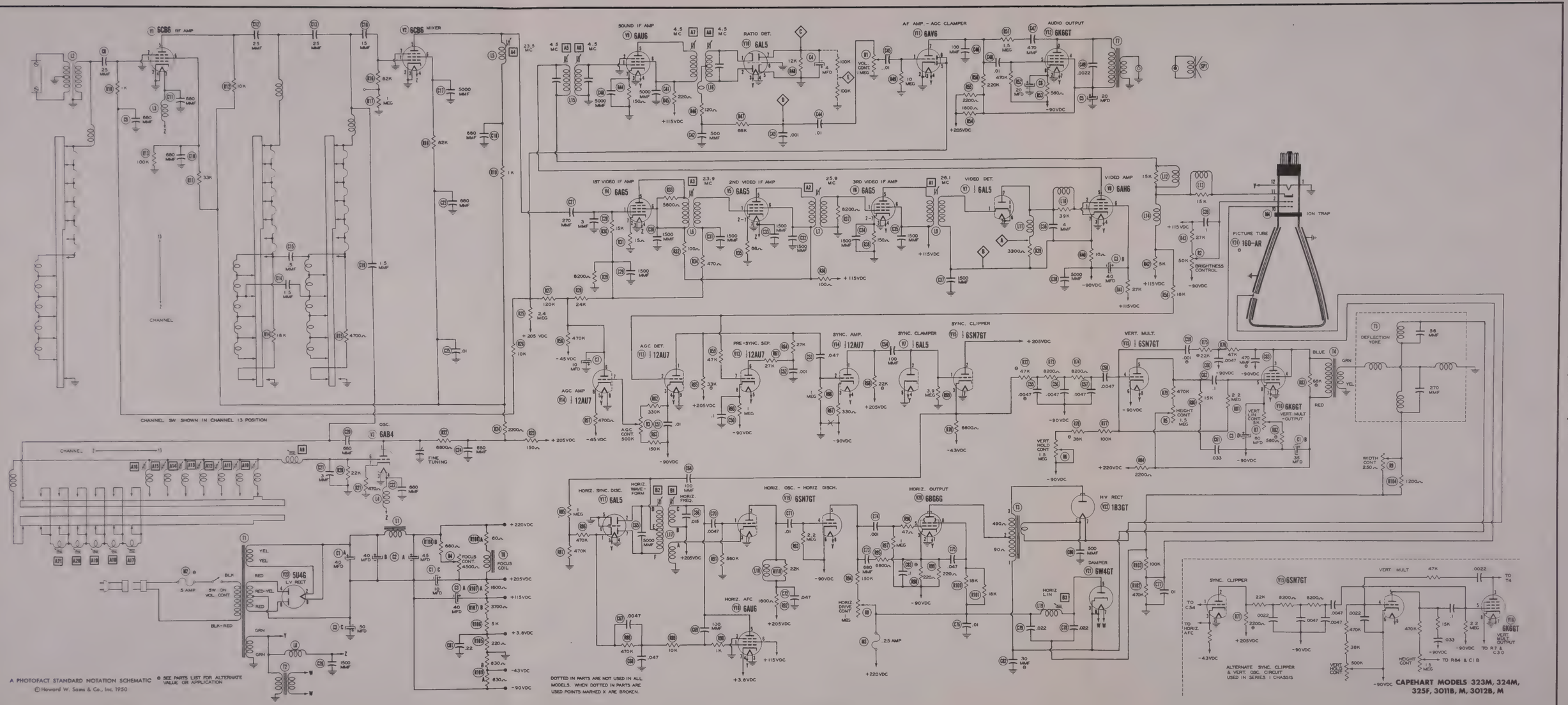
CAPEHART MODELS 323M, 324M, 325F, 3011B, M, 3012B, M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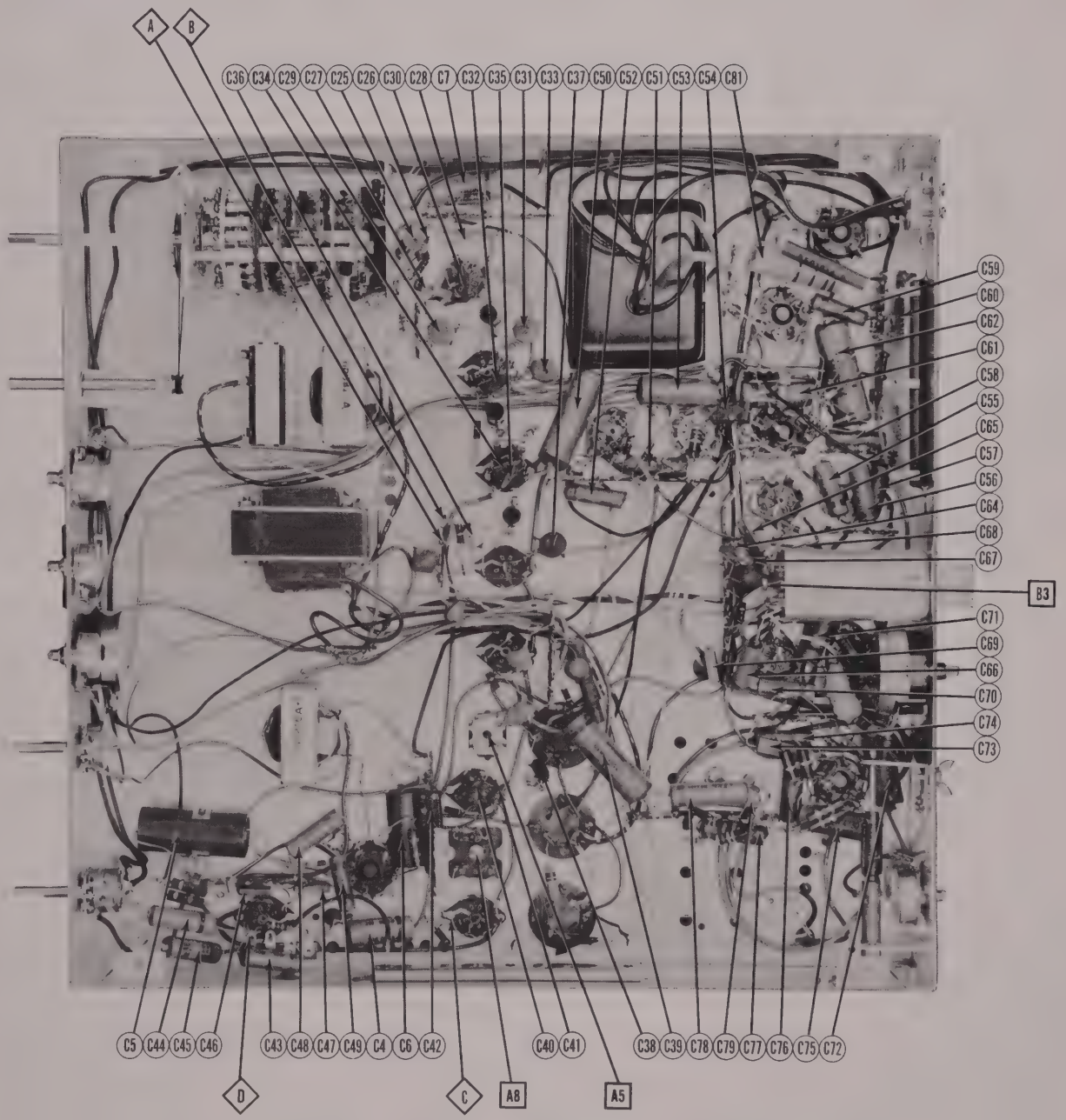
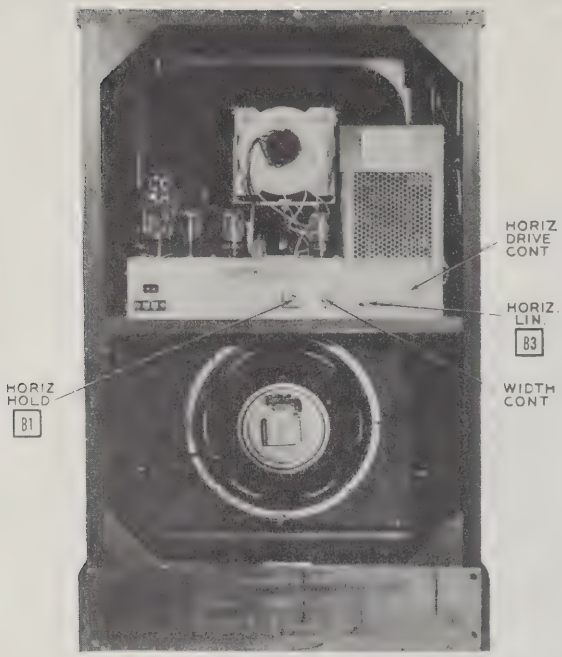
CHANNEL SW SHOWN IN CHANNEL 13 POSITION
ALTERNATE SYNC. CLIPPER & VERT. OSC. CIRCUIT USED IN SERIES 1 CHASSIS
CAPEHART MODELS 323M, 324M, 325F, 3011B, M, 3012B, M

CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW–CAPACITOR AND ALIGNMENT IDENTIFICATION



CABINET-REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

HORIZONTAL OSCILLATOR ADJUSTMENT

Turn the set on and tune in a TV station, preferably a test pattern. Remove horizontal SYNC. DISC. tube (V17) from its socket and adjust the horizontal frequency slug (B1) until the picture synchronizes horizontally. The picture will move slowly back and forth with one vertical blanking bar present when properly adjusted.

Replace V17 and the picture should fall into "sync". If, after this adjustment has been made, the picture does not fall into synchronization, the AFC detector phasing may require adjustment..... Adjust the horizontal phasing slug (B2) until 1/4 inch of the blanking bar is visible at the right hand edge of the picture. If B2 has been changed a great amount, it may be necessary to readjust B1 for optimum results.

HORIZONTAL WIDTH, DRIVE, AND LINEARITY ADJUSTMENTS.

Turn the horizontal drive control clockwise as far as possible without crowding the right side of the picture. Adjust the width control until the picture fills the mask horizontally. Adjust the horizontal linearity slug (B3) for best linearity from left to right. A slight readjustment of the horizontal drive control may be necessary for optimum results.

AGC ADJUSTMENT

Turn the contrast control to the mid-position of its range.
Tune in a TV station, preferably a test pattern.
Adjust the AGC control for normal contrast in the picture.

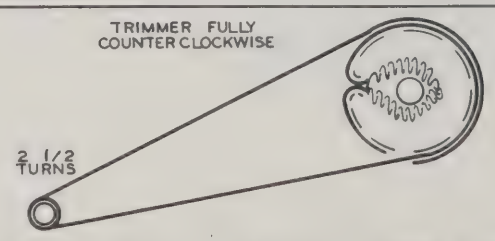
DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove four push-on type control knobs.
2. Remove three wood screws holding rear cover closed.
3. Disconnect built-in antenna.
4. Remove screws from hinges. Remove cover.
5. Disconnect speaker leads at chassis.
6. Remove four 5/16" hex head bolts holding chassis in cabinet. Remove chassis.
7. Remove four 3/8" hex nuts holding speaker in cabinet. Remove speaker.

PICTURE TUBE REMOVAL

1. Remove four Phillips head screws located under front panel. (Two on either side of cabinet)
2. Remove two metal latches.
3. Remove guide from back of glass plate at side of cabinet. Remove glass plate.
4. Remove mask.
5. Remove rubber covered metal strap holding picture tube in place.
6. Remove ion trap and socket from base of tube.
7. Remove picture tube.



FINE TUNING DIAL CORD STRINGING

VOLTAGE AND RESISTANCE MEASUREMENTS

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6CB6	-.4VDC	0V.	6.3VAC	0V.	85VDC	70VDC	0V.		
V 2	6CB6	-1.2VDC	0V.	0V.	6.3VAC	160VDC	70VDC	0V.		
V 3	6AB4	170VDC	0V.	0V.	6.3VAC	170VDC	§-1.7VDC	2VDC		
V 4	6AG5	-5.2VDC	0V.	0V.	6.3VAC	145VDC	145VDC	0V.		
V 5	6AG5	-5.6VDC	0V.	0V.	6.3VAC	145VDC	145VDC	0V.		
V 6	6AG5	0V.	1.5VDC	0V.	6.3VAC	145VDC	145VDC	1.5VDC		
V 7	6AL5	-80VDC	-37VDC	0V.	6.3VAC	0V.	0V.	-80VDC		
V 8	6AH6	-80VDC	-80VDC	0V.	6.3VAC	55VDC	37VDC	-80VDC		
V 9	6AU6	0V.	0V.	0V.	6.3VAC	140VDC	140VDC	1.2VDC		
V 10	6AL5	-.2VDC	-.2VDC	6.3VAC	0V.	0V.	0V.	-.4VDC		
V 11	6AV6	-.5VDC	0V.	0V.	6.3VAC	-7.8VDC	-7.8VDC	100VDC		
V 12	6K6GT	0V.	0V.	190VDC	205VDC	-75VDC	0V.	6.3VAC	-65VDC	
V 13	12AU7	225VDC	55VDC	50VDC 60VDC	6.3VAC	6.3VAC	215VDC	50VDC	60VDC	0V.
V 14	12AU7	-30VDC	-85VDC	-85VDC	6.3VAC	6.3VAC	-2VDC	-60VDC -30VDC	-42VDC	0V.
V 15	6SN7GT	-37VDC	225VDC	-42VDC	-100VDC -115VDC	145VDC 40VDC	-90VDC	0V.	6.3VAC	
V 16	6K6GT	0V.	0V.	260VDC	260VDC	-95VDC -75VDC	0V.	6.3VAC	-60VDC -85VDC	
V 17	6AL5	.8VDC	-25VDC	6.3VAC	0V.	0V.	0V.	-25VDC		
V 18	6AU6	.5VDC	0V.	0V.	6.3VAC	215VDC	115VDC	3.8VDC		
V 19	6SN7GT	-15VDC	200VDC	.1VDC	-80VDC	130VDC -14VDC	-90VDC	0V.	6.3VAC	
V 20	6BG6G	0V.	0V.	-65VDC	-70VDC	-70VDC	0V.	6.3VAC	170VDC	TOP CAP *
V 21	6W4GT	0V.	0V.	250VDC	0V.	265VDC	0V.	¶	¶	
V 22	1B3GT	* DO NOT MEASURE.								
V 23	5U4G	0V.	320VDC	0V.	300VAC	0V.	300VAC	0V.	320VDC	
V 24	160-AR	0V.	-80VDC	PIN 10 400VDC 440VDC	PIN 11 50VDC	PIN 12 6.3VAC				

§ TAKEN WITH VACUUM TUBE VOLTMETER.
¶ 6.3 VAC MEASURED ACROSS FILAMENTS.
* DO NOT MEASURE.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6CB6	160KΩ	0Ω	.1Ω	0Ω	†15KΩ	†27KΩ	0Ω		
V 2	6CB6	1 Meg.	0Ω	0Ω	.1Ω	†4KΩ	†85KΩ	0Ω		
V 3	6AB4	†7KΩ	Inf.	0Ω	.1Ω	†7KΩ	22KΩ	470Ω		
V 4	6AG5	23KΩ	15Ω	0Ω	.1Ω	†2.2KΩ	†2.2KΩ	15Ω		
V 5	6AG5	8.7KΩ	68Ω	0Ω	.1Ω	†2.1KΩ	†2.1KΩ	68Ω		
V 6	6AG5	.5Ω	150Ω	0Ω	.1Ω	†2KΩ	†2KΩ	150Ω		
V 7	6AL5	1.3KΩ	3.9 Meg.	0Ω	.1Ω	0Ω	0Ω	4.6KΩ		
V 8	6AH6	4.6KΩ	1.3KΩ	0Ω	.1Ω	†7KΩ	†29KΩ	1.3KΩ		
V 9	6AU6	2.7Ω	0Ω	0Ω	.1Ω	†2.2KΩ	†2.2KΩ	150Ω		
V 10	6AL5	Inf.	Inf.	.1Ω	0Ω	0Ω	0Ω	12KΩ		
V 11	6AV6	10 Meg.	0Ω	0Ω	.1Ω	150KΩ	150KΩ	†220KΩ		
V 12	6K6GT	Inf.	0Ω	†2KΩ	†1.6KΩ	470KΩ	Inf.	.1Ω	1.8KΩ	
V 13	12AU7	†33KΩ	†25KΩ	980KΩ	.1Ω	.1Ω	†90KΩ	†70KΩ	1 Meg.	0Ω
V 14	12AU7	†24KΩ	1 Meg.	1.6KΩ	.1Ω	.1Ω	30KΩ	150KΩ 650KΩ	5.1KΩ	0Ω
V 15	6SN7GT	3.9 Meg.	†500Ω	7.4KΩ	140KΩ 1.6 Meg.	†470KΩ †2 Meg.	1.2KΩ	0Ω	.1Ω	
V 16	6K6GT	Inf.	0Ω	†2.8KΩ	†2.8KΩ	2.3 Meg. 3.8 Meg.	Inf.	.1Ω	7KΩ 2KΩ	
V 17	6AL5	940KΩ	1.5 Meg.	.1Ω	0Ω	0Ω	0Ω	1.5 MegΩ		
V 18	6AU6	1.4 Meg.	0Ω	0Ω	.1Ω	†500Ω	†2KΩ	†10KΩ		
V 19	6SN7GT	560KΩ	†2.3KΩ	1Ω	2.2 Meg.	†150KΩ †1.1 Meg.	1.2KΩ	0Ω	.1Ω	
V 20	6BG6G	Inf.	0Ω	1.5KΩ	8.3KΩ	1 Meg.	Inf.	.1Ω	†9KΩ	TOP CAP #90Ω
V 21	6W4GT	Inf.	Inf.	600KΩ	Inf.	†100Ω	Inf.	600KΩ	600KΩ	
V 22	1B3GT	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	TOP CAP #580Ω
V 23	5U4G	Inf.	10KΩ	Inf.	1.3KΩ	Inf.	1.3KΩ	Inf.	10KΩ	
V 24	160-AR	0Ω	1.2KΩ	PIN 10 #100KΩ	PIN 11 †7KΩ	PIN 12 .1Ω				

FOCUS CONTROL SET FULLY COUNTERCLOCKWISE.
† MEASURED FROM PIN 2 OF V23.
# MEASURED FROM PIN 3 OF V21.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltage measured at 1,000 ohms.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. Front panels controls set at minimum.
6. Where readings may vary according to the setting of the service controls, both minimum and maximum readings are given.

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

To eliminate the high voltage shock hazard remove the horizontal output tube V20 from its socket.

VIDEO IF ALIGNMENT

Remove the local oscillator tube V3 from its socket to eliminate erroneous indications.
Remove the AGC detector tube V13 and connect the negative terminal of a 3 volt battery to pin 6 of 12AU7 (V13) and positive terminal to chassis.
It should be noted that the common lead of the VTVM is at approximately -90 volts potential with respect to chassis. Avoid touching or grounding the VTVM case.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	Direct	High side to ungrounded tube shield floating over mixer tube (V2). Low side to chassis.	26.1MC (Unmod.)	Any	DC Probe to Point (A). Common to Point (B).	A1	Adjust for maximum deflection.
2.	Direct	"	25.9MC	"	"	A2	"
3.	Direct	"	23.9MC	"	"	A3	"
4.	Direct	"	23.5MC	"	"	A4	"

OVERALL VIDEO IF RESPONSE CHECK

Connect the synchronized sweep voltage from the signal generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
5.	Direct	High side to ungrounded tube shield floating over mixer tube (V2). Low side to chassis.	24MC (10MC SWP)	21.75MC 23.25MC 26.25MC	Any	Vert. Amp. to Point (A). Low side to chassis.		Check for response curve similar to figure 1. The 26.25MC and 23.25MC should be at 50% of response. If necessary, SLIGHTLY retouch A1 thru A4 for proper response.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect two matched 100KΩ (± 1%) resistors in series from point C to chassis. The junction of these two resistors is alignment point E as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
6.	1500MMF	High side to pin 1 (Grid) of 6AH6 (V8). Low side to chassis.	4.5MC (Unmod.)	Any	DC Probe to Point (C). Common to chassis.	A5, A6 A7	Adjust for maximum deflection.
7.	1500MMF	"	"	"	DC Probe to Point (D). Common to Point (E).	A8	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60 ∿ modulation and 450KC sweep. Use 120 ∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
6.	1500MMF	High side to pin 1 (Grid) of 6AH6 (V8). Low side to chassis.	4.5MC (450KC Sweep)	4.5MC	Any	Vert. Amp. to Point (C). Low side to chassis.	A5, A6, A7	Disconnect stabilizer capacitor C4. Adjust for maximum amplitude and symmetry as per figure 2.
7.	1500MMF	"	"	"	"	Vert. Amp. to Point (D). Low side to chassis.	A8	Reconnect capacitor C4. Adjust A8 to place 4.5MC at center of crossover lines as per figure 3. SLIGHTLY retouch A7 for maximum and straightness of crossover lines.

OSCILLATOR ALIGNMENT

Replace the local oscillator tube (V3) in its socket.
Connect the 3 volt battery as in Video IF Alignment.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
8.	Two 120Ω carbon res.	Across antenna terminals with 120Ω in each lead.	213MC (10MC SWP)	211.25MC 215.75MC	13	Vert. Amp. to Point (A). Low side to chassis.	A9	Set channel 13 oscillator slug (A10) to center of its range. Adjust A9 to place video marker at 50% of response as shown in figure 4.
9.	"	"	207MC (10MC SWP)	205.25MC 209.75MC	12	"	A11	Adjust for response curve similar to figure 4 with video marker at 50% of response, and sound marker as shown. If any individual channel adjustment does not have sufficient range a compromise adjustment of A9 will be required. If A9 is adjusted, the oscillator adjustments must be repeated.
			201MC (10MC SWP)	199.25MC 203.75MC	11		A12	
			195MC (10MC SWP)	193.25MC 197.75MC	10		A13	
			189MC (10MC SWP)	187.25MC 191.75MC	9		A14	
			183MC (10MC SWP)	181.25MC 185.75MC	8		A15	
			177MC (10MC SWP)	175.25MC 179.75MC	7		A16	
			85MC (10MC SWP)	83.25MC 87.75MC	6		A17	
			79MC (10MC SWP)	77.25MC 81.75MC	5		A18	
			69MC (10MC SWP)	67.25MC 71.75MC	4		A19	
			63MC (10MC SWP)	61.25MC 55.75MC	3		A20	
			57MC (10MC SWP)	35.25MC 59.75MC	2		A21	

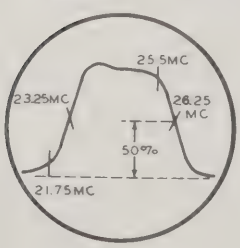


FIG. 1

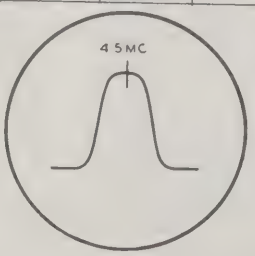


FIG. 2

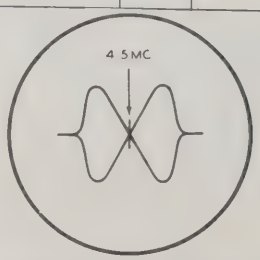


FIG. 3

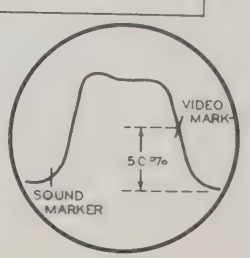
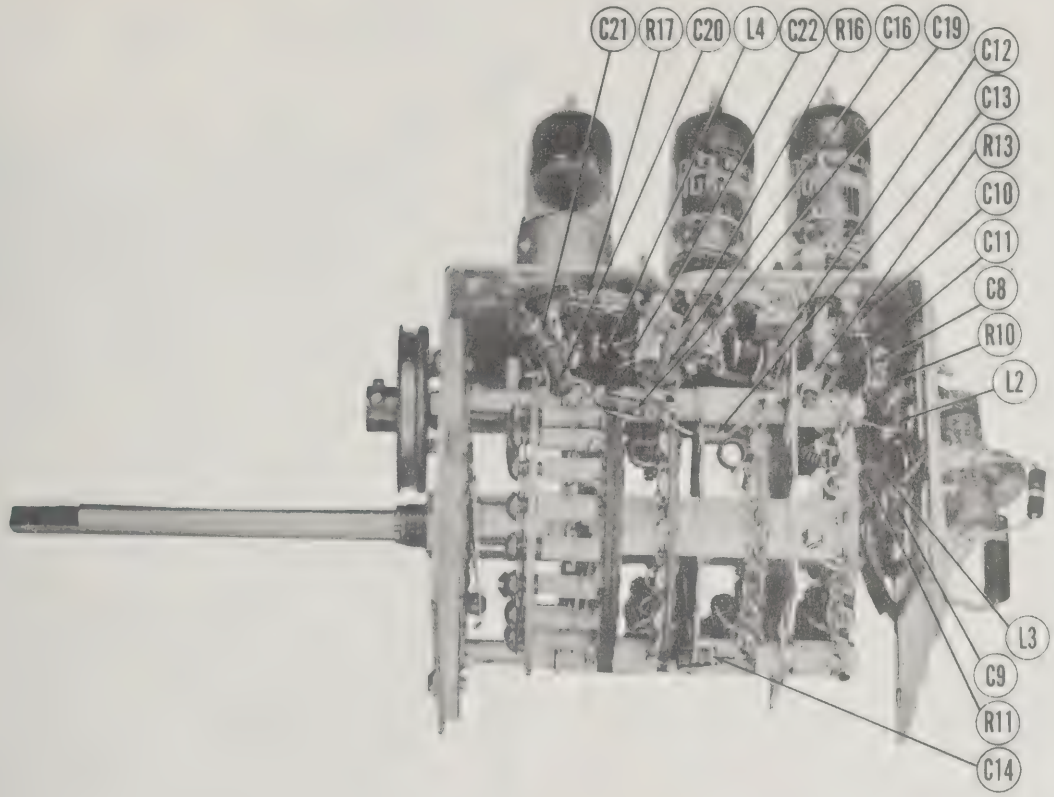
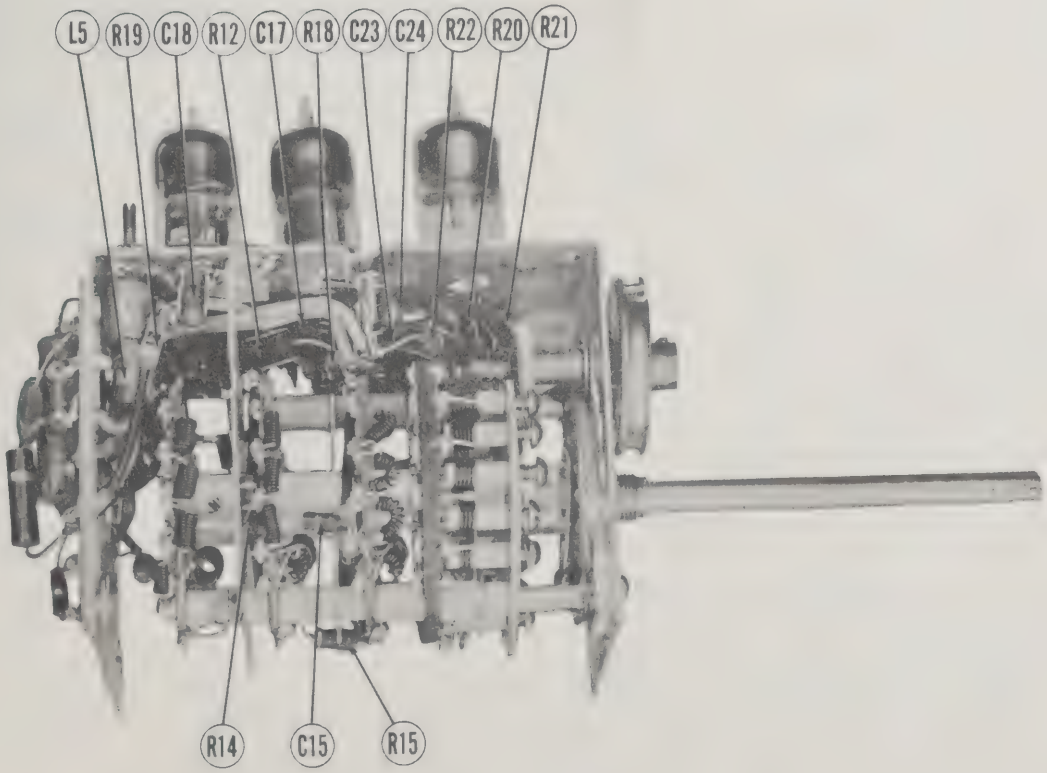


FIG. 4



RF TUNER-RIGHT SIDE



RF TUNER-LEFT SIDE

VOLTAGE AND RESISTANCE MEASUREMENTS

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6CB6	-.4VDC	0V.	6.3VAC	0V.	85VDC	70VDC	0V.		
V 2	6CB6	-1.2VDC	0V.	0V.	6.3VAC	160VDC	70VDC	0V.		
V 3	6AB4	170VDC	0V.	0V.	6.3VAC	170VDC	§-1.7VDC	2VDC		
V 4	6AG5	-5.2VDC	0V.	0V.	6.3VAC	145VDC	145VDC	0V.		
V 5	6AG5	-5.6VDC	0V.	0V.	6.3VAC	145VDC	145VDC	0V.		
V 6	6AG5	0V.	1.5VDC	0V.	6.3VAC	145VDC	145VDC	1.5VDC		
V 7	6AL5	-80VDC	-37VDC	0V.	6.3VAC	0V.	0V.	-80VDC		
V 8	6AH6	-80VDC	-80VDC	0V.	6.3VAC	55VDC	37VDC	-80VDC		
V 9	6AU6	0V.	0V.	0V.	6.3VAC	140VDC	140VDC	1.2VDC		
V 10	6AL5	-.2VDC	-.2VDC	6.3VAC	0V.	0V.	0V.	-.4VDC		
V 11	6AV6	-.5VDC	0V.	0V.	6.3VAC	-7.8VDC	-7.8VDC	100VDC		
V 12	6K6GT	0V.	0V.	190VDC	205VDC	-75VDC	0V.	6.3VAC	-65VDC	
V 13	12AU7	225VDC	55VDC	50VDC 60VDC	6.3VAC	6.3VAC	215VDC	50VDC	60VDC	0V.
V 14	12AU7	-30VDC	-85VDC	-85VDC	6.3VAC	6.3VAC	-2VDC	-60VDC -30VDC	-42VDC	0V.
V 15	6SN7GT	-37VDC	225VDC	-42VDC	-100VDC -115VDC	145VDC 40VDC	-90VDC	0V.	6.3VAC	
V 16	6K6GT	0V.	0V.	260VDC	260VDC	-95VDC -75VDC	0V.	6.3VAC	-60VDC -85VDC	
V 17	6AL5	.8VDC	-25VDC	6.3VAC	0V.	0V.	0V.	-25VDC		
V 18	6AU6	.5VDC	0V.	0V.	6.3VAC	215VDC	115VDC	3.8VDC		
V 19	6SN7GT	-15VDC	200VDC	.1VDC	-80VDC	130VDC -14VDC	-90VDC	0V.	6.3VAC	
V 20	6BG6G	0V.	0V.	-65VDC	-70VDC	-70VDC	0V.	6.3VAC	170VDC	TOP CAP *
V 21	6W4GT	0V.	0V.	250VDC	0V.	265VDC	0V.	¶	¶	
V 22	1B3GT	* DO NOT MEASURE.								
V 23	5U4G	0V.	320VDC	0V.	300VAC	0V.	300VAC	0V.	320VDC	
V 24	160-AR	0V.	-80VDC	PIN 10 400VDC 440VDC	PIN 11 50VDC	PIN 12 6.3VAC				

§ TAKEN WITH VACUUM TUBE VOLTMETER.
¶ 6.3 VAC MEASURED ACROSS FILAMENTS.
* DO NOT MEASURE.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6CB6	160KΩ	0Ω	.1Ω	0Ω	†15KΩ	†27KΩ	0Ω		
V 2	6CB6	1 Meg.	0Ω	0Ω	.1Ω	†4KΩ	†85KΩ	0Ω		
V 3	6AB4	†7KΩ	Inf.	0Ω	.1Ω	†7KΩ	22KΩ	470Ω		
V 4	6AG5	23KΩ	15Ω	0Ω	.1Ω	†2.2KΩ	†2.2KΩ	15Ω		
V 5	6AG5	8.7KΩ	68Ω	0Ω	.1Ω	†2.1KΩ	†2.1KΩ	68Ω		
V 6	6AG5	.5Ω	150Ω	0Ω	.1Ω	†2KΩ	†2KΩ	150Ω		
V 7	6AL5	1.3KΩ	3.9 Meg.	0Ω	.1Ω	0Ω	0Ω	4.6KΩ		
V 8	6AH6	4.6KΩ	1.3KΩ	0Ω	.1Ω	†7KΩ	†29KΩ	1.3KΩ		
V 9	6AU6	2.7Ω	0Ω	0Ω	.1Ω	†2.2KΩ	†2.2KΩ	150Ω		
V 10	6AL5	Inf.	Inf.	.1Ω	0Ω	0Ω	0Ω	12KΩ		
V 11	6AV6	10 Meg.	0Ω	0Ω	.1Ω	150KΩ	150KΩ	†220KΩ		
V 12	6K6GT	Inf.	0Ω	†2KΩ	†1.6KΩ	470KΩ	Inf.	.1Ω	1.8KΩ	
V 13	12AU7	†33KΩ	†25KΩ	980KΩ	.1Ω	.1Ω	†90KΩ	†70KΩ	1 Meg.	0Ω
V 14	12AU7	†24KΩ	1 Meg.	1.6KΩ	.1Ω	.1Ω	30KΩ	150KΩ 650KΩ	5.1KΩ	0Ω
V 15	6SN7GT	3.9 Meg.	†500Ω	7.4KΩ	140KΩ 1.6 Meg.	†470KΩ †2 Meg.	1.2KΩ	0Ω	.1Ω	
V 16	6K6GT	Inf.	0Ω	†2.8KΩ	†2.8KΩ	2.3 Meg. 3.8 Meg.	Inf.	.1Ω	7KΩ 2KΩ	
V 17	6AL5	940KΩ	1.5 Meg.	.1Ω	0Ω	0Ω	0Ω	1.5 MegΩ		
V 18	6AU6	1.4 Meg.	0Ω	0Ω	.1Ω	†500Ω	†2KΩ	†10KΩ		
V 19	6SN7GT	560KΩ	†2.3KΩ	11Ω	2.2 Meg.	†150KΩ †1.1 Meg.	1.2KΩ	0Ω	.1Ω	
V 20	6BG6G	Inf.	0Ω	1.5KΩ	8.3KΩ	1 Meg.	Inf.	.1Ω	†9KΩ	TOP CAP #90Ω
V 21	6W4GT	Inf.	Inf.	600KΩ	Inf.	†100Ω	Inf.	600KΩ	600KΩ	
V 22	1B3GT	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	TOP CAP #580Ω
V 23	5U4G	Inf.	10KΩ	Inf.	1.3KΩ	Inf.	1.3KΩ	Inf.	10KΩ	
V 24	160-AR	0Ω	1.2KΩ	PIN 10 #100KΩ	PIN 11 †7KΩ	PIN 12 .1Ω				

FOCUS CONTROL SET FULLY COUNTERCLOCKWISE.
† MEASURED FROM PIN 2 OF V23.
# MEASURED FROM PIN 3 OF V21.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltage measured at 1,000 ohms.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. Front panels controls set at minimum.
6. Where readings may vary according to the setting of the service controls, both minimum and maximum readings are given.

CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: CAPEHART PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	NOTES
V1	RF Amp.	6CB6	6CB6	6CK	
V2	Mixer	6CB6	6CB6	6CK	
V3	Oscillator	6AB4	6AB4	5CE	
V4	1st Video IF	6AG5	6AG5	7BD	
V5	2nd Video IF	6AG5	6AG5	7BD	
V6	3rd Video IF	6AG5	6AG5	7BD	
V7	Video Det. -Sync. Clamper	6AL5	6AL5	6BT	
V8	Video Amp.	6AH6	6AH6	7BK	
V9	Sound IF Amp.	6AU6	6AU6	7BK	
V10	Ratio Det.	6AL5	6AL5	6BT	
V11	AF Amp. -AGC Clamper	6AV6	6AV6	7BT	
V12	Audio Output	6K6GT	6K6GT	7S	
V13	AGC Det. -Pre-Sync. Sep.	12AU7	12AU7	9A	
V14	AGC Amp. -Sync. Amp.	12AU7	12AU7	9A	
V15	Sync. Clipper-Vert. Mult.	6SN7GT	6SN7GT	8BD	
V16	Vert. Mult. - Output	6K6GT	6K6GT	7S	
V17	Hor. Sync. Disc.	6AL5	6AL5	6BT	
V18	Horiz. AFC	6AU6	6AU6	7BK	
V19	Horiz. Osc. - Horiz. Disch.	6SN7GT	6SN7GT	8BD	
V20	Hor. Output	6BG6G	6BG6G	5BT	
V21	Damper	6W4GT	5W4GT	4CG	
V22	HV Rect.	1B3GT	1B3GT	3C	
V23	LV Rect.	5U4G	5U4G	5T	
V24A	Picture Tube	160-AR		12D	
B	Picture Tube	16RP4	16RP4	12D	
C	Picture Tube	16XP4	16XP4	12D	
D	Picture Tube	16TP4	16TP4	12D	
E	Picture Tube	16KP4	16KP4	12D	
F	Picture Tube	16GP4	16GP4	12D	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: CAPEHART PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CENTRALAB PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	40	475	750090B-12	AFH882J		UPT44150		TVL-3787	▲ Filter
B	35	475							■ Decoupling
C	10	475							▲ Filter
C2A	45	475	750090B-14	AFH88J		UPT44150		TVL-2830	▲ Filter
B	40	475							▲ Filter
C3A	40	475	750090B-13	AFH88J8F10 D16B		UPT450-425V10 BR5015A			▲ Filter
B	40	250							■ V. Amp. Screen
C	50	150							▲ Filter
D	80	50							V. Output Cath. Byp.
C4	4	50	650228A-4	PRS150/4		BBR4-50T		TVA-1303	Stabilizing Cap.
C5	20	450	650228A-2	PRS450/20		BR2045A		TVA-1709	Decoupling
C6	30	150	650228A-1	PRS250/20		BR2015A		TVA-1410	Output Cath. Byp.
C7	10	50	650228A-3	PRS150/10		BR105		TVA-1304	AGC Filter
C8	25			GP25M	D6-250		GP1K-25		RF Coupling
C9	680			GP680M	D6-681		GP2K-680		AGC Filter
C10	680			GP680M	D6-681		GP2K-680		RF Decoupling
C11	680			GP680M	D6-681		GP2K-680		RF Fil. Bypass
C12	25			GP25M	D6-250		GP1K-25		RF Coupling
C13	.25								RF Coupling
C14	1.5			SII. 5DNPO	TCZ-1.5		NPOK-1.5		RF Coupling
C15	.5				TCZ-.5				RF Coupling
C16	15			GP15M	D6-150		GP1K-15		RF Coupling
C17	5000			BPD-005	DD-502	811-005		29C1	Mixer Screen Byp.
C18	680			GP680M	D6-681		GP2K-680		Mixer Plate Dec.
C19	1.5			SII. 5DNPO	TCZ-1.5		NPOK-1.5		Osc. Coupling
C20	680			GP680M	D6-681		GP2K-680		Osc. Feedback
C21	3						N150K-3		Fixed Trimmer
C22	680			GP680M	D6-681		GP2K-680		Osc. Fil. Bypass
C23	680			GP680M	D6-681		GP2K-680		RF Bypass
C24	680			GP680M	D6-681		GP2K-680		RF Bypass
C25	.01	600	2248A-1030	P688-01	D6-103		811-01		RF Bypass
C26	1500		450469-2	BPD-005	DD-152		811-0015	29C3	Filament Bypass
C27	270	500	650162A-5	1468-00025	D6-271	5W5T25	GP2K-270	1FM-325	IF Coupling
C28	3						N150K-3		1st V. IF Grid
C29	1500		450469-2	BPD-0015	DD-152	1W5D15	811-0015	29C3	AGC Filter
C30	1500		450469-2	BPD-0015	DD-152	1W5D15	811-0015	29C3	1st V. IF Dec.
C31	1500		450469-2	BPD-0015	DD-152	1W5D15	811-0015	29C3	AGC Filter
C32	1500		450469-2	BPD-0015	DD-152	1W5D15	811-0015	29C3	2nd V. IF Decoup.
C33	1500		450469-2	BPD-0015	DD-152	1W5D15	811-0015	29C3	2nd V. IF Fil.
C34	1500		450469-2	BPD-0015	DD-152	1W5D15	811-0015	29C3	3rd V. IF Cath.
C35	1500		450469-2	BPD-0015	DD-152	1W5D15	811-0015	29C3	3rd V. IF Decoupling
C36	4		650030A-1	GP5M	TCZ-4.7	5W5V5	GP1K-5	MS-55	V. Diode Filter
C37	1500		450469-2	BPD-0015	DD-152	1W5D15	811-0015	29C3	V. Amp. Cath. Bypass
C38	5000		450469-1	BPD-005	DD-502	1D5D5	811-005	29C1	RF Bypass
C39	.1	600	2248A-1040	P688-1	DF-104	PTE6P1		TM-1	Ptc. Tube Grid Filter
C40	5000		450469-1	BPD-005	DD-502	1D5D5	811-005	29C1	S. IF Cathode
C41	5000		450469-1	BPD-005	DD-502	1D5D5	811-005	29C1	S. IF Decoupling
C42	500	500	25189	1468-0005	D6-501	5W5T5	GP2K-500	1FM-35	Diode Load Cap.
C43	.001	600	2248A-1020	P688-001	D6-102	PTE6D1	GP2L-001	TM-21	De-emphasis
C44	.01	600	2248A-1030	P688-01	D6-103	PTE6S1	811-01	TM-11	Audio Coupling
C45	.01	600	2248A-1030	P688-01	D6-103	PTE6S1	811-01	TM-11	Audio Coupling
C46	100	500	25188	1468-0001	D6-101	5W5T1	GP1K-100	1FM-31	AF Amp. Plate Byp.
C47	470	500	25189	1468-0005	D6-471	5W5T5	GP2K-470	1FM-35	AF Feedback
C48	.01	600	2248A-1030	P688-01	D6-103	PTE6S1	811-01	TM-11	Audio Coupling
C49	.0022	600	2248A-2220	P688-0022	D6-223	PTE6D2	GP2M-0022	TM-22	Output Plate Byp.
C50	.1	600	2248A-1040	P688-1	DF-104	PTE6P1		TM-1	Sync. Amp. Cath.
C51	.01	600	2248A-1030	P688-01	D6-103	PTE6S1	811-01	TM-11	Sync. Amp. Cath.

CAPACITORS (CONT.)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: CAPEHART PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CENTRALAB PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C52	.001	600	2248A-1020	P688-001	D6-102	PTE6D1	GP2L-001	TM-21	Vert. Sync. Amp. Plate
C53	.047	600	2248A-4730	P688-047	D6-503	PTE6S5		TM-15	Sync. Coupling
C54	100	500	25188	1468-0001	D6-101	5W5T1	GP1K-100	1FM-31	Sync. Coupling
C55	.0047	600	2248A-4720	P688-0047	D6-472	PTE6D5	GP2M-0047	TM-25	Integrator Net. *
C56	.0047	600	2248A-4720	P688-0047	D6-472	PTE6D5	GP2M-0047	TM-25	Integrator Net.
C57	.0047	600	2248A-4720	P688-0047	D6-472	PTE6D5	GP2M-0047	TM-25	Integrator Net.
C58	.0047	600	2248A-4720	P688-0047	D6-472	PTE6D5	GP2M-0047	TM-25	Vert. MV Grid
C59	.001	600	2248A-1020	P688-001	D6-102	PTE6D1	GP2L-001	TM-21	Vert. MV Feedback *
C60	.0047	600	2248A-4720	P688-0047	D6-472	PTE6D5	GP2M-0047	TM-25	Voltage Divider
C61	.033	600	2248A-3330	P688-033		PTE6S3		TM-13	Vert. Discharge
C62	.1	600	2248A-1040	P688-1	DF-104	PTE6P1		TM-1	Vert. Sweep Coupling
C63	470	1500	650162A-7						Fixed Trimmer †
C64	100	500	25188	1468-0001	D6-101	5W5T1	GP1K-100	1FM-31	Hor. Sync. Coupling
C65	5000	500	2247A-4725	1467-005		1D5D5		1FM-25	Fixed Trimmer
C66	.015	400	2247A-1535	P488-015		PTE6S15			Fixed Trimmer
C67	.0047	600	2248A-4720	P688-0047	D6-472	PTE6D5	GP2M-0047	TM-25	AFC Filter
C68	.047	600	2248A-4730	P688-047	DF-503	PTE6S5		TM-15	AFC Filter
C69	100	500	25188	1468-0001	D6-101	5W5T1	GP1K-100	1FM-31	Phase Shifter
C70	.0047	600	2248A-4720	P688-0047	D6-472	PTE6D5	GP2M-0047	TM-25	Hor. Osc. Grid
C71	.01	600	2248A-1030	P688-01	D6-103	PTE6S1	811-01	TM-11	Hor. Sweep Coup.
C72	.047	600	2248A-4730	P688-047	DF-503	PTE6S5		TM-15	Hor. Disch. Dec.
C73	680	500	25503		D6-681	1W5T7	GP2K-680	1FM-37	Hor. Discharge
C74	.001	600	2248A-1020	P688-001	D6-102	PTE6D1	GP2L-001	TM-21	Hor. Sweep Coupling.
C75	.047	600	2248A-4730	P688-047	DF-503	PTE6S5		TM-15	Hor. Output Screen
C76	.01	600	2248A-1030	P688-01	D6-103	PTE6S1	811-01	TM-11	Decoupling
C77	.01	600	2248A-1030	P688-01	D6-103	PTE6S1	811-01	TM-11	Decoupling
C78	.022	600	2248A-2230	P688-022	DF-203	PTE6S2		TM-12	Damper Filter
C79	.022	600	2248A-2230	P688-022	DF-203	PTE6S2		TM-12	Damper Filter
C80	500	20000	650153B-2	HV20C	TV3-502				HV Filter
C81	.22	200	2246A-2240	P488-22		GT2P25		TM-2-2	RF Bypass
C82	30	6000							Fixed Trimmer † #
C83	.1	200		P288-1	DF-104	PTE4P1		TM-1-2	Hor. Output Cath. †

* Some models use .0022MMF in this application. Mfgr's Part No. 2248A-2220.
† Not used in all models.
# Later production has C82 connected from plate of 6BG6G and chassis to increase width.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: CAPEHART PART No.	REPLACEMENT DATA: IRC PART No.	REPLACEMENT DATA: CLAROSTAT PART No.	REPLACEMENT DATA: CENTRALAB PART No.	INSTALLATION NOTES
R1A	1 Meg.	½	450896B-1	Q13-137	AG-63-Z	B-70-S	Volume control
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Attach to R1A per instructions
C	Switch		Not Req.	76-1	SWB	Not Req.	Attach to R1A per instructions
R2A	50KΩ	½	450898B-1	Q11-123	AG-44-S	B-31	Brightness control
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Attach to R2A per instructions
R3A	500KΩ	½	450897A-1	Q11-133	AG-58-S	B-59 *	AGC control
B	Shaft		Not Req.	RQ	FKS-1/4	Not Req.	Attach to R3A per instructions
R4	4500Ω	4	450891A-1		RTV-106		Focus control-Wire Wound
R5A	1.5 Meg.	½	450892A-1	Q11-138	AG-83-S	AN-75	Height control
B	Shaft		Not Req.	RQ	FKS-1/4	AK-1	Attach to R5A per instructions
R6A	1.5 Meg.	½	450892A-1†	Q11-138	AG-83-S	AN-75	Vert. hold control
B	Shaft		Not Req.	RQ	FKS-1/4	AK-1	Attach to R6A per instructions
R7	5000Ω	2	450893A-1	W-5000 *	43-5000 *	VK-135	Vert. linearity control-Wire Wound
R8A	1 Meg.	½	450894A-1	Q11-137	AM-61-S	AN-69	Horiz. drive control
B	Shaft		Not Req.	Not Req.	FKS-1/4	AK-1	Attach to R8A per instructions
R9	250Ω	4	450966A-1		RTV-60	SVP-984	Width control-Wire Wound

* File slot in end of shaft to duplicate original.
† Some models use a 500KΩ control. Part No. 450897A-1.

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: CAPEHART PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES ALL RESISTORS ARE ± 10% UNLESS OTHERWISE STATED.
R10	100Ω	½	3229A-102	BTS-1000	RF Amp. Grid
R11	33KΩ 20%	½	3229A-333		RF Amp. Screen
R12	10KΩ 20%	1	3232A-103		RF Amp. Plate Load
R13	100KΩ	½	3229A-104	BTS-100K	Bleeder
R14	18KΩ	½	3229A-183		RF Coil Shunt
R15	4700Ω	½	3229A-472	BTS-4700	RF Coil Shunt
R16	82KΩ	½	3229A-823	BTS-82K	Mixer Grid
R17	1 Meg. 20%	½	3229A-105	BTS-1 Meg.	Mixer Grid
R18	82KΩ	½	3229A-823	BTS-82K	Mixer Screen
R19	1000Ω	½	3229A-102	BTS-1000	Mixer Plate Decoupling
R20	22KΩ 20%	½	3229A-223		Osc. Grid
R21	470Ω 20%	½	3229A-471	BTS-470	Osc. Cathode
R22	6800Ω 20%	1	3229A-682		Osc. Plate Load
R23	150Ω	½	3229A-151	BTS-150	Decoupling
R24	2200Ω	1	3232A-222	BTA-2200	Voltage Divider
R25	2.4 Meg. 5%	½	3228A-245		Voltage Divider
R26	10KΩ	½	3229A-103		AGC Network
R27	120KΩ 5%	½	3228A-124	BTS-120K-5%	AGC Network
R28	24KΩ 5%	½	3228A-243		AGC Network
R29	8200Ω	½	3229A-822	BTS-8200	AGC Network
R30	15KΩ 20%	½	3229A-153	BTS-15K	1st Video IF Grid
R31	150	½	3229A-150		1st Video IF Cathode
R32	100Ω	½	3229A-101	BTS-100	1st Video IF Decoupling
R33	5600Ω	½	3229A-562	BTS-5600	2nd Video IF Transformer Shunt
R34	470Ω	½	3229A-471	BTS-470	AGC Network
R35	68Ω	½	3229A-680		2nd Video IF Cathode
R36	100Ω	½	3229A-101	BTS-100	Decoupling
R37	8200Ω	½	3229A-822	BTS-8200	3rd Video IF Transformer Shunt
R38	150Ω	½	3229A-151	BTS-150	3rd Video IF Cathode
R39	3300Ω	½	3229A-332	BTS-3300	Video Det. Diode Load
R40	10Ω	½	3229A-100	BW-½-10	Video Amp. Cathode
R41	27KΩ	½	3229A-273	BTS-27K	Video Amp. Screen
R42	5000Ω	7	650101A-8	1 3/4A-5000	Video Amp. Plate Load-Wire Wound
R43	27KΩ	½	3229A-273	BTS-27K	Voltage Divider
R44	150Ω	½	3229A-151	BTS-150	Sound IF Cathode
R45	220Ω	½	3229A-221	BTS-220	Sound IF Decoupling
R46	120Ω 20%	½	3229A-121	BTS-120	Balancing

RESISTORS (CONT.)

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: CAPEHART PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES
R47	68KΩ	½	3229A-683	BTS-68K	De-emphasis
R48	12KΩ	½	3229A-123		Ratio Det. Diode Load
R49	10 Meg.	½	3229A-106	BTS-10 Meg.	AF Amp. Grid
R50	220KΩ	½	3229A-224	BTS-220K	AF Amp. Plate Load
R51	1.5 Meg.	½	3229A-155	BTS-1.5 Meg.	Feedback
R52	470KΩ	½	3229A-474	BTS-470K	Output Grid
R53	560Ω	1	3232A-561	BTA-560	Output Cathode
R54	1800Ω	1	3232A-182	BTA-1800	Output Decoupling
R55	2200Ω	1	3232A-222	BTA-2200	Output Decoupling
R56	470KΩ	½	3229A-474	BTS-470K	AGC Network
R57	4700Ω	½	3229A-472	BTS-4700	AGC Amp. Cathode
R58	18KΩ	½	3229A-183	BTS-18K	Isolation
R59	47KΩ	½	3229A-473	BTS-47K	Isolation
R60	1 Meg.	½	3229A-105	BTS-1 Meg.	AGC Det. Cathode
R61	27KΩ	½	3229A-273	BTS-27K	AGC Det. Plate Load
R62	330KΩ	½	3229A-334	BTS-330K	Voltage Divider
R63	150KΩ 5%	½	3228A-154	BTS-150K-5%	Voltage Divider
R64	27KΩ	½	3229A-273	BTS-27K	AGC Det. Plate Decoupling
R65	33KΩ	½	3229A-333	BTS-33K	Sync. Sep. Plate Decoupling-See Note 1
R66	1 Meg.	½	3229A-105	BTS-1 Meg.	Sync. Amp. Grid
R67	330Ω	½	3229A-331	BTS-330	Sync. Amp. Cathode
R68	22KΩ	1	3232A-223	BTA-22K	Sync. Amp. Plate Load -See Note 2
R69	3.9 Meg.	½	3929A-395	BTS-3.9 Meg.	Sync. Clipper Grid
R70	6800Ω	1	3232A-682	BTA-6800	Sync. Clipper Cathode
R71	2200Ω	½	3229A-222	BTS-2200	Sync. Clipper Plate Load-See Note 3
R72	47KΩ	½	3229A-473	BTS-47K	Integrator Network-See Note 4
R73	8200Ω	½	3229A-822	BTS-8200	Integrator Network
R74	8200Ω	½	3229A-822	BTS-8200	Integrator Network
R75	22KΩ	½	3229A-223	BTS-22K	Vert. MV Feedback-See Note 3
R76	47KΩ	½	3229A-473	BTS-47K	Vert. MV Feedback
R77	100KΩ 20%	½	3229A-104	BTS-100K	Vert. MV Grid
R78	38KΩ	½	450917A-1		Vert. MV Grid-Temperator Compensation
R79	470KΩ	½	3229A-474	BTS-470K	Vert. MV Plate Load
R80	15KΩ	½	3229A-153	BTS-15K	Vert. Peaking
R81	2.2 Meg.	½	3229A-225	BTS-2.2 Meg.	Vert. Output Grid
R82	560Ω	1	3232A-561	BTA-560	Vert. Output Cathode-See Note 5
R83	68KΩ	½	3229A-683	BTS-68K	Vert. Output Transformer Shunt-See Note 6
R84	2200Ω	1	3232A-222	BTA-2200	Decoupling
R85	1 Meg.	½	3229A-105	BTS-1 Meg.	Hor. AFC Diode Load
R86	470KΩ	½	3229A-474	BTS-470K	Hor. AFC Diode Load
R87	470KΩ	½	3229A-474	BTS-470K	Hor. AFC Diode Load
R88	470KΩ	½	3229A-474	BTS-470K	Hor. AFC Filter Network
R89	10KΩ	½	3229A-103	BTS-10K	Hor. AFC Filter Network
R90	1000Ω	½	3229A-102	BTS-1000	Hor. AFC Grid
R91	560KΩ	½	3229A-564	BTS-560K	Hor. Osc. Grid
R92	1800Ω	1	3232A-182	BTA-1800	Hor. Osc. Plate Decoupling
R93	2.2 Meg.	½	3229A-225	BTS-2.2 Meg.	Hor. Discharge Grid
R94	150KΩ 5%	½	3228A-154	BTS-150K-5%	Hor. Discharge Plate Load
R95	6800Ω	½	3229A-682	BTS-6800	Hor. Peaking
R96	47Ω	½	3229A-470		Parasitic Suppressor
R97	1 Meg.	½	3229A-105	BTS-1 Meg.	Hor. Output Grid
R98	220Ω	1	3232A-221	BW-1-220	Hor. Output Cathode
R99	220Ω	1	3232A-221	BW-1-220	Hor. Output Cathode
R100	18KΩ	1	3232A-183	BTA-18K	Hor. Output Screen
R101	18KΩ	1	3232A-183	BTA-18K	Hor. Output Screen
R102	470KΩ	1	3232A-474	BTA-470K	Bleeder
R103	100KΩ 20%	½	3229A-104	BTS-100K	Acc. Anode Decoupling
R104	1200Ω	1	3232A-122	BTA-1200	Width Control Shunt
R105	220Ω	½	3229A-221	BW-½-220	Bleeder
R106	5000Ω	7	650101A-8	1 3/4A-5000	Voltage Divider-Wire Wound
R107A	1600Ω	12	650212A-1		Voltage Divider-Wire Wound
B	3700Ω	5			Voltage Divider
R108A	60Ω	2	650211A-1		Voltage Divider-Wire Wound
B	680Ω	5			Focus Coil Shunt
R109A	630Ω	10	650213A-1		Voltage Divider-Wire Wound
B	630Ω	10			Bleeder
R110	22KΩ	½	3229A-223	BTS-22K	Peaking Coil Shunt

Note 1. Some models use 47KΩ in this application.
Note 2. Some models use two 47KΩ resistors in parallel in this application.
Note 3. Not used in all models.
Note 4. Some models use 22KΩ in this application.
Note 5. Some models use 1000Ω in this application.
Note 6. Some models use 100KΩ in this application.

TRANSFORMER (POWER)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: CAPEHART PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.
T1	117VAC @ 2.4A	750VCT .270ADC	5VAC @ 3A	6.3VAC @ 10A	750144A-1		P-3067	

TRANSFORMER (FILAMENT)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: CAPEHART PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.
T2	6.3VAC @ 1.6A	6.3VAC @ 1.2A			650243A-1			

PARTS LIST AND DESCRIPTION CONTINUED ON PAGE 15

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING DC RESISTANCE PRI.	RATING DC RESISTANCE SEC.	REPLACEMENT DATA CAPEHART PART No.	REPLACEMENT DATA STANCOR PART No.	REPLACEMENT DATA MERIT PART No.	REPLACEMENT DATA CHICAGO PART No.	NOTES
T3	580Ω Tap @ 90Ω	0Ω	750163A-1				Hor. Output Trans.
T4	415Ω	.4Ω	650238A-1				Vert. Output Trans.
T5A	45Ω		750155A-G1				Hor. Deflection Coil
B	.3Ω						Vert. Deflection Coil
T6	480Ω		750149A-1				Focus Coil

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING IMPEDANCE PRI.	RATING IMPEDANCE SEC.	RATING DC RES. PRI.	RATING DC RES. SEC.	REPLACEMENT DATA CAPEHART PART No.	REPLACEMENT DATA STANCOR PART No.	REPLACEMENT DATA MERIT PART No.	REPLACEMENT DATA CHICAGO PART No.	INSTALLATION NOTES
T7	5000Ω	4.1Ω	450Ω	.6Ω	650216A-1	A-3877 ⊥	A-3019	RO-9	

SPEAKER

ITEM No.	RATINGS FIELD RES.	RATINGS V. C. IMP.	REPLACEMENT DATA CAPEHART PART No.	REPLACEMENT DATA JENSEN PART No.	REPLACEMENT DATA QUAM PART No.	NOTES
SP1A	PM	4.1Ω	850082A-1	ST-101 ① MOD. P12-T	12A4A	① Replace output transformer to match 6-8Ω voice coil.
B	PM		750151A-1			
	CONE DIA.	V. C. DIA.				
SP2A	11 3/4"	1"				
B	7 3/4"					

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D. C. RESISTANCE	RATINGS INDUCTANCE (0 CURRENT 1000 ∿)	REPLACEMENT DATA CAPEHART PART No.	REPLACEMENT DATA STANCOR PART No.	REPLACEMENT DATA MERIT PART No.	REPLACEMENT DATA CHICAGO PART No.	INSTALLATION NOTES
L1	.270ADC	68Ω	1 Henry	614215A-1	C-2326 ①	C-2996 ①	TR-3300①	① Drill one new mounting hole.

COILS (RF-IF)

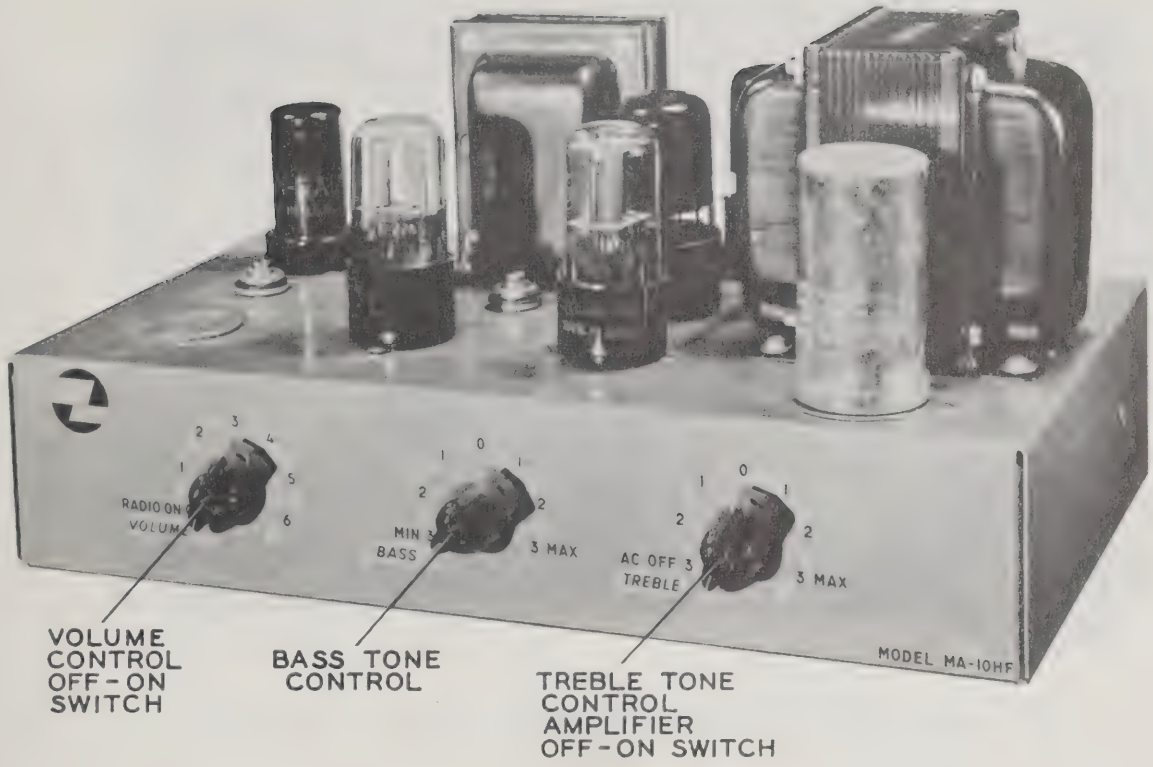
ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA CAPEHART PART No.	REPLACEMENT DATA MEISSNER PART No.	NOTES
L2	Ant. Trans.	.1Ω	0Ω			Part of tuner, #850078D-1
L3	Fil. Choke	0Ω				Part of tuner, #850078D-1
L4	Fil. Choke	0Ω				Part of tuner, #850078D-1
L5	1st Video IF	.3Ω				Part of tuner, #850078D-1
L6	2nd Video IF	.5Ω	.5Ω	650218A-1		
L7	3rd Video IF	.5Ω	.5Ω	650218A-1		
L8	Fil. Choke	0Ω				
L9	4th Video IF	.5Ω	.5Ω	650218A-1		
L10	Peaking	5.5Ω		650219A-1	19-1921 ①	180 microhenries, wound on 39KΩ resistor.
L11	Peaking	11.5Ω		650220A-1	19-1923	500 microhenries
L12	Peaking	3.7Ω		650219A-3	19-1920②	98 microhenries, wound on 15KΩ resistor.
L13	Peaking	3.7Ω		650219A-3	19-1920 ②	98 microhenries, wound on 15KΩ resistor.
L14	Peaking	11.5Ω		650220A-3	19-1922	250 microhenries
L15	Sound IF	2.7Ω	2.7Ω	450518A-2		
L16	Ratio Det. Trans.	2.8Ω	3Ω	650235A-1		
L17	Hor. Osc. Trans.	85Ω	11Ω	650230A-1		Terminal B to terminal C: 40Ω
L18	Hor. Osc. Peaking	22Ω		650221A-1		11 microhenries
L19	Hor. Lin.	28Ω		450477A-1		4-27 microhenries

① Parallel with 39KΩ resistor.
② Parallel with 15KΩ resistor.

MISCELLANEOUS

ITEM No.	PART NAME	CAPEHART PART No.	NOTES
M1	RF Tuner	850078D-1	
M2	Fuse	48006	5A Not used in all models
M3	Fuse	450183A-1	.25A 250V Type 3AG
M4	Ion Trap	650161A-4	
	Knob	650210B-3	Channel selector
	Knob	650239A-3	Fine tuning
	Knob	650210B-4	Volume
	Knob	650239A-4	Contrast

MASCO
MODEL MA-10HF



MASCO
MODEL MA-10HF

MASCO MODEL MA-10HF

TRADE NAME	Masco, Model MA-10HF		
MANUFACTURER	Mark Simpson Mfg. Co., Inc., 32-28 49th St., Long Island City 3, New York		
TYPE SET	AC Operated Audio Amplifier		
TUBES (SIX)	Types 6SL7GT 1st and 2nd AF Amp., 6SC7GT Pre Amp., 6SL7GT 3rd AF-Phase Inverter, (2) 6V6GT Power Output, 5Y3GT Rectifier		
POWER SUPPLY	110-120 Volts AC	RATING	.60 Amp. at 117 Volts AC

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PARTS LIST AND DESCRIPTIONS

MASCO
MODEL MA-10HF

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: MASCO PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	1st and 2nd AF Amp.	6SL7GT	6SL7GT	8BD	
V2	Pre Amp.	6SC7GT	6SC7GT	8S	
V3	3rd AF Amp. - Phase Inv.	6SL7GT	6SL7GT	8BD	
V4	Power Output	6V6GT	6V6GT	7AC	
V5	Power Output	6V6GT	6V6GT	7AC	
V6	Rectifier	5Y3G	5Y3G	5T	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA: MASCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	20	450		AF444J		UP22245		TVL-3780	■ Filter
B	20	450							● Filter
C	10	450							▲ Filter
C2A	8	450		PRS450/8-8		EDL8D45		TVA-2720	Decoupling
B	8	450							Decoupling
C3	8	450		PRS450/8		BR845A		TVA-1704	Decoupling
C4	50	50		PRS50/50		BR505		TVA-1308	Output Cath. Byp.
C5	.1	600		P688-1	DF-104	PTE6P1		6TM-P1	Audio Coupling
C6	1000			SI1000	D6-102	1W5D1	GP2L-001	1FM-21	Tone Compensation
C7	.01	600		P688-01	D6-103	PTE6S1	811-01	6TM-S1	Tone Compensation
C8	.005	400		P688-005	D6-502	PTE6D5	811-005	6TM-D5	Tone Compensation
C9	.05	200		P288-05	DF-503	PTE4S5		2TM-S5	Tone Compensation
C10	.05	200		P288-05	DF-503	PTE4S5		2TM-S5	Audio Coupling
C11	.05	600		P688-05	DF-503	PTE6S5		6TM-S5	Pre-Amp. Dec.
C12	.05	600		P688-05	DF-503	PTE6S5		6TM-S5	Pre-Amp. Dec.
C13	.05	200		P288-05	DF-503	PTE4S5		2TM-S5	Audio Coupling
C14	.05	600		P688-05	DF-503	PTE6S5		6TM-S5	Audio Coupling
C15	.05	600		P688-05	DF-503	PTE6S5		6TM-S5	Audio Coupling
C16	25			SI25	D6-250	5W5Q25	GP1K-25	1FM-425	AF Feedback
C17	.1	600		P688-1	DF-104	PTE6P1		6TM-P1	Audio Coupling
C18	.1	600		P688-1	DF-104	PTE6P1			Audio Coupling
C19	.1	600		P688-1	DF-104	PTE6P1			Line Filter

CONTROLS

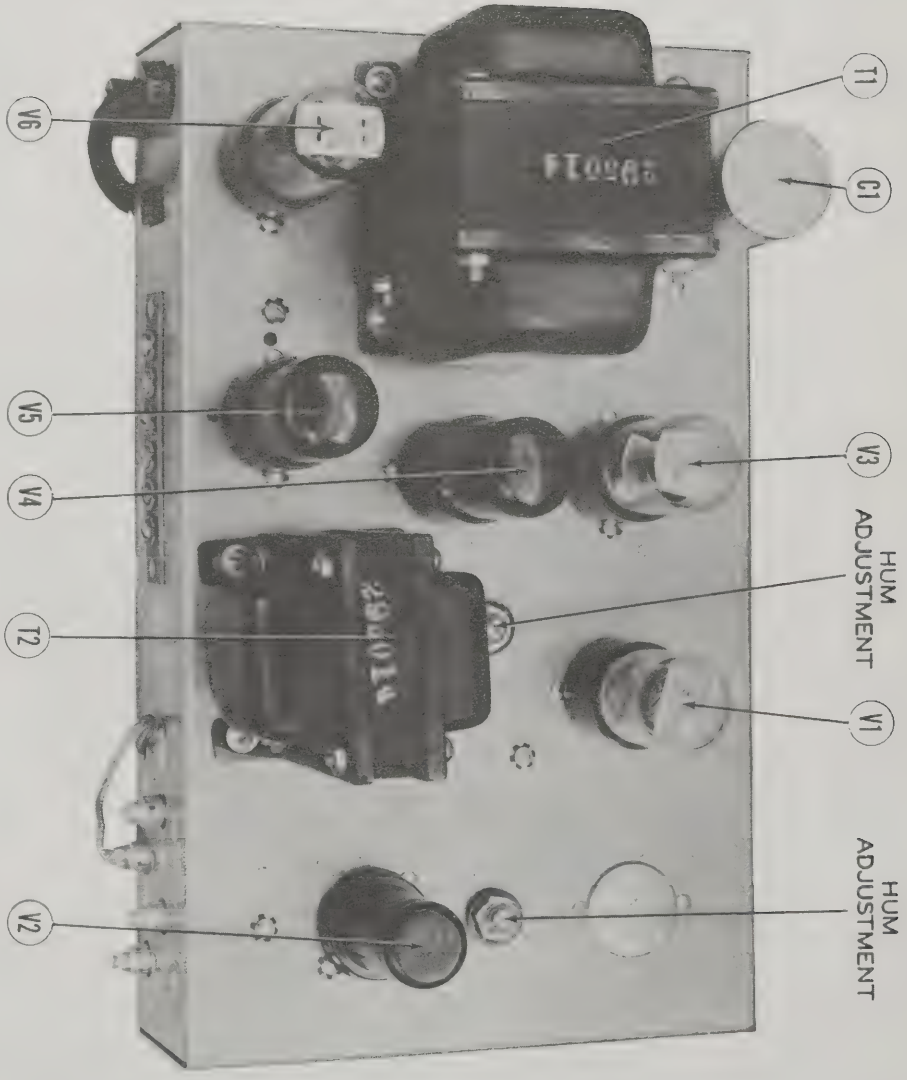
ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA: MASCO PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	INSTALLATION NOTES
R1A	500KΩ	½		Q13-133	AM-60-Z	B-60-S	Volume control
B	Shaft			Not Req.	RS-2	Not Req.	Attach to R1A per instructions
C	Switch			76-1	SW-A	Not Req.	Attach to R1A per instructions
R2A	500KΩ	½		Q13-133	AM-60-Z	B-60-S	Treble Tone control
B	Shaft			Not Req.	RS-2	Not Req.	Attach to R2A per instructions
C	Switch			76-1	SW-A	Not Req.	Attach to R2A per instructions
R3A	500KΩ	½		Q13-133	AM-60-Z	B-60	Bass tone control
B	Shaft			Not Req.	RS-2	Not Req.	Attach to R3A per instructions
R4	50Ω	1		W-50 *	43-50	VK-116	Hum control-Wire Wound
R5	50Ω	1		W-50 *	43-50	VK-116	Hum control-Wire Wound

* File slot in shaft to duplicate original.

RESISTORS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA: MASCO PART No.	IRC PART No.	IDENTIFICATION CODES
R6	240KΩ	½		BTS-270K	Isolation-See Note 1
R7	240KΩ	½		BTS-270K	Isolation-See Note 1
R8	470Ω	½		BTS-470	1st AF Cathode
R9	10KΩ	½		BTS-10K	1st AF Plate

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		IDENTIFICATION CODES
	RESISTANCE	WATTS	MASCO PART No.	IRC PART No.	
R10	100KΩ	½		BTS-100K	Tone Compensation
R11	10KΩ	½		BTS-10K	Tone Compensation
R12	1500Ω	½		BTS-1500	2nd AF Cathode
R13	47KΩ	½		BTS-47K	2nd AF Plate
R14	240KΩ	½		BTS-270K	3rd AF Grid
R15	1500Ω	½		BTS-1500	3rd AF Cathode
R16	100KΩ	½		BTS-100K	3rd AF Plate
R17	8200Ω	½		BTS-8200	Phase Inv. Grid
R18	100KΩ	½		BTS-100K	Phase Inv. Plate
R19	1500Ω	½		BTS-1500	Phase Inv. Cathode
R20	100KΩ	½		BTS-100K	Output Grid
R21	100KΩ	½		BTS-100K	Output Grid
R22	250Ω	10		1 3/4A-250	Output Cathode-Wire Wound
R23	4300Ω	½		BTS-4700	Feedback-See Note 2
R24	4700Ω	½		BTS-4700	Audio Voltage Divider
R25	100KΩ	½		BTS-100K	Audio Voltage Divider
R26	27KΩ	½		BTS-27K	Audio Voltage Divider
R27	100KΩ	½		BTS-100K	Pre-Amp. Grid
R28	10KΩ	½		BTS-10K	Pre-Amp. Plate
R29	47KΩ	2		BTS-47K	Pre-Amp. Plate Decoupling
R30	100KΩ	½		BTS-100K	Pre-Amp. Grid
R31	10KΩ	½		BTS-10K	Pre-Amp. Plate
R32	47KΩ	2		BTS-47K	Pre-Amp. Plate Decoupling
R33	150KΩ	½		BTS-150K	Decoupling
R34	47KΩ	½		BTS-47K	Decoupling
R35	27KΩ	½		BTS-27K	Decoupling
R36	5000Ω	1		BTA-4700	Filter
R37	15 Meg.	½		BTS-15 Meg.	Voltage Divider
R38	27KΩ	½		BTS-27K	Decoupling

Note 1. Some models use a 270KΩ resistor in this application.
Note 2. Some models use a 4700Ω resistor in this application

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA			
	PRI.	SEC. 1	SEC. 2	SEC. 3	MASCO PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.
T1	117VAC @ .60A	660VCT .075ADC	5VAC @ 2A	6.3VAC @ 2.1A	P-8	P-4079 ①	P-3152 ①	PV-90 ①

① Drill new mounting holes.

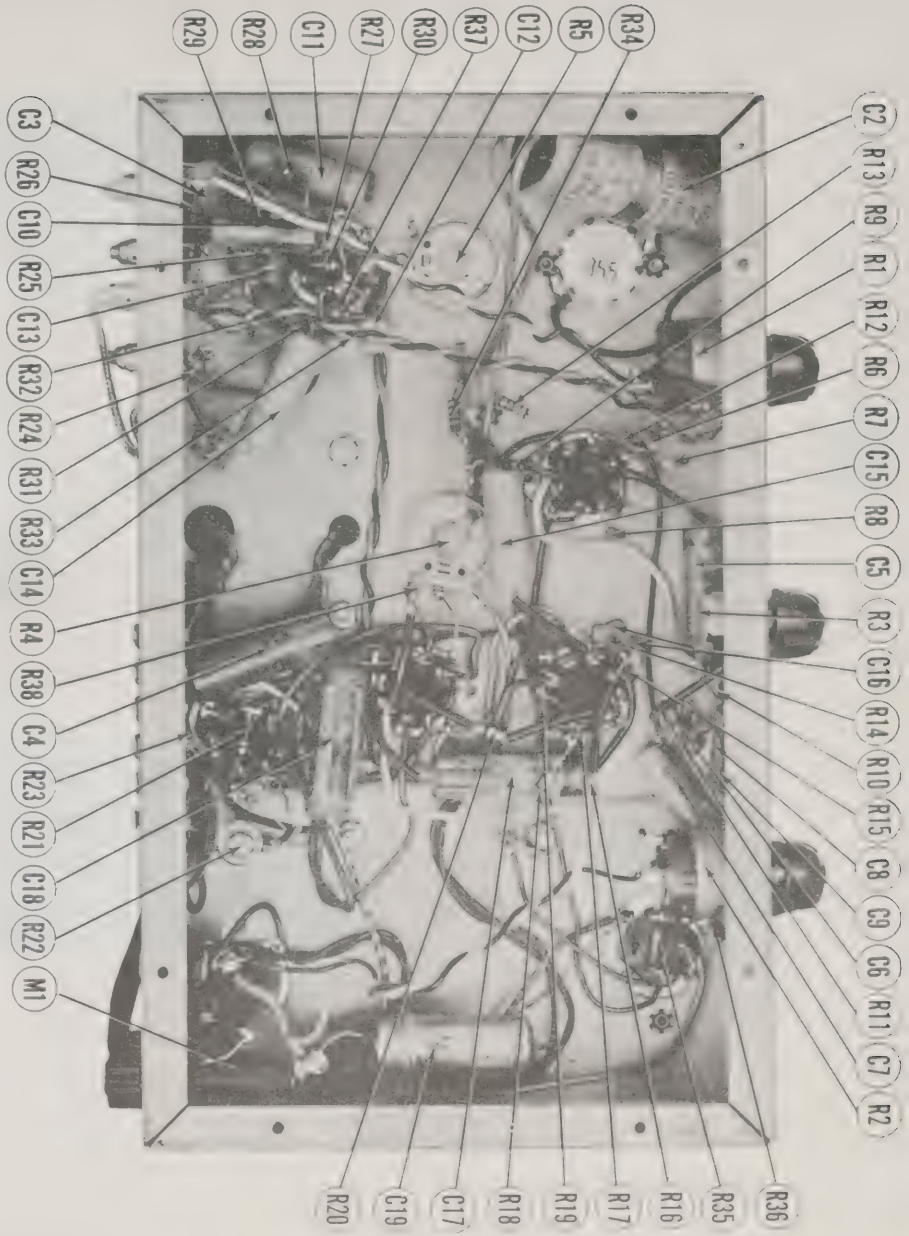
TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		MASCO PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
	PRI.	SEC.	PRI.	SEC.					
T2	6200Ω CT	2Ω 4Ω 8Ω 15Ω 500Ω	100Ω CT	.28Ω .3Ω .4Ω .5Ω 22Ω	O-17E		A-3130 ①		① Drill New Mtg. Holes

MISCELLANEOUS

ITEM No.	PART NAME	MASCO PART No.	NOTES
M1	Fuse		3 Amp. 250V

CHASSIS—BOTTOM VIEW

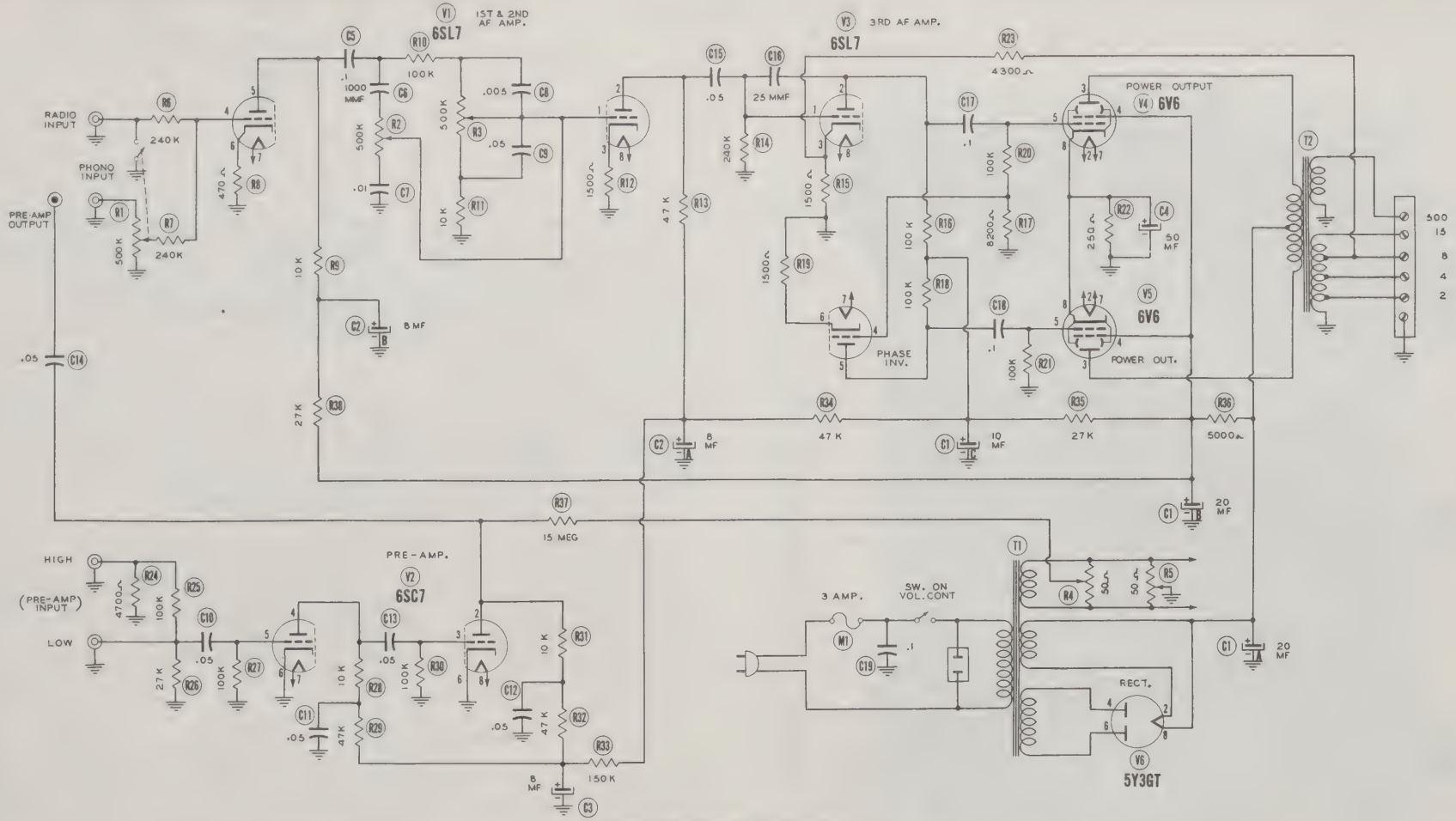


SET 112

FOLDER 4

MASCO
MODEL MA-10HF

MASCO
MODEL MA-10HF



PHONO VOLUME CONTROL IN "OFF" POSITION.

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	6SL7GT	0V.	95VDC	1VDC	0V.	190VDC	1.2VDC	¶	¶
V 2	6SC7GT	0V.	23VDC	-.6VDC	-.6VDC	27VDC	0V.	¶	¶
V 3	6SL7GT	0V.	115VDC	.8VDC	0V.	125VDC	1VDC	¶	¶
V 4	6V6GT	0V.	¶	320VDC	275VDC	0V.	125VDC	¶	17VDC
V 5	6V6GT	0V.	¶	320VDC	275VDC	0V.	9VDC	¶	17VDC
V 6	5Y3GT	0V.	330VDC	0V.	320VAC	0V.	320VAC	0V.	330VDC

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	6SL7GT	10KΩ	†125KΩ	1.5KΩ	270KΩ	†42KΩ	470Ω	12Ω	12Ω
V 2	6SC7GT	0Ω	†240KΩ	100KΩ	100KΩ	†180KΩ	0Ω	12Ω	12Ω
V 3	6SL7GT	240KΩ	†130KΩ	1.5KΩ	8.2KΩ	†130KΩ	1.5KΩ	12Ω	12Ω
V 4	6V6GT	0Ω	12Ω	50Ω	5KΩ	108KΩ	†140KΩ	12Ω	250Ω
V 5	6V6GT	0Ω	12Ω	50Ω	5KΩ	106KΩ	1.2KΩ	12Ω	250Ω
V 6	5Y3GT	Inf.	50KΩ	Inf.	140Ω	Inf.	140Ω	Inf.	50KΩ

† MEASURED FROM PIN 8 OF V6.
¶ 6.3VAC MEASURED ACROSS FILAMENTS.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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1. DC Voltage measurements are at 20,000 ohms per volt ; AC Voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

PHOTOFACT* Folder

MOTOROLA MODELS
14K1, B, 14T1, B (CH. TS-88)

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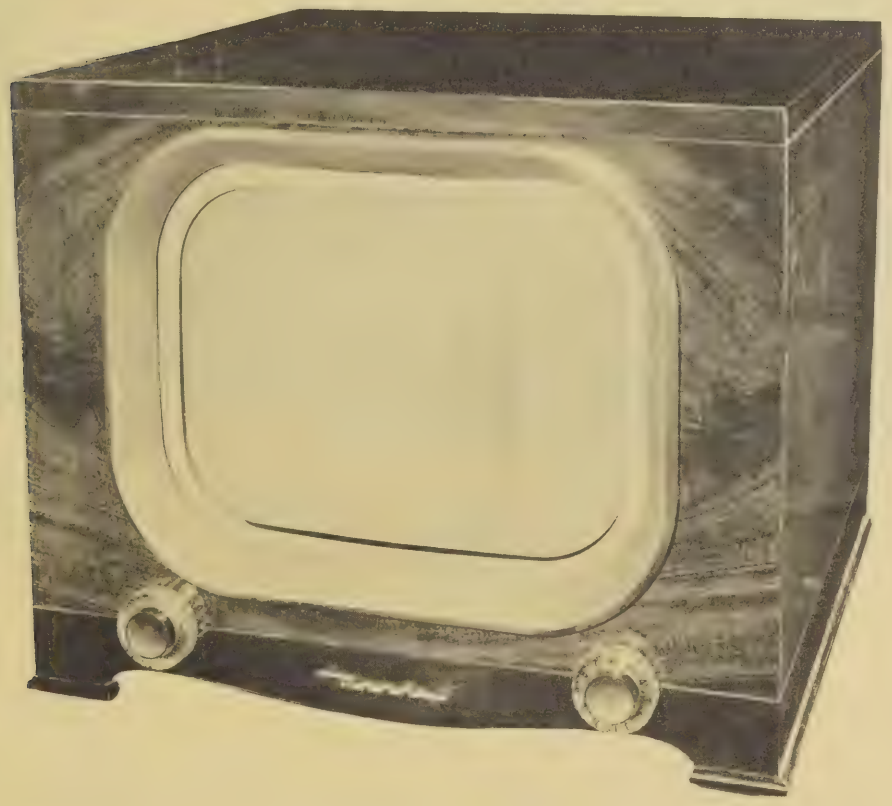

MODEL 14T1

MOTOROLA MODELS
14K1, B, 14T1, B (CH. TS-88)

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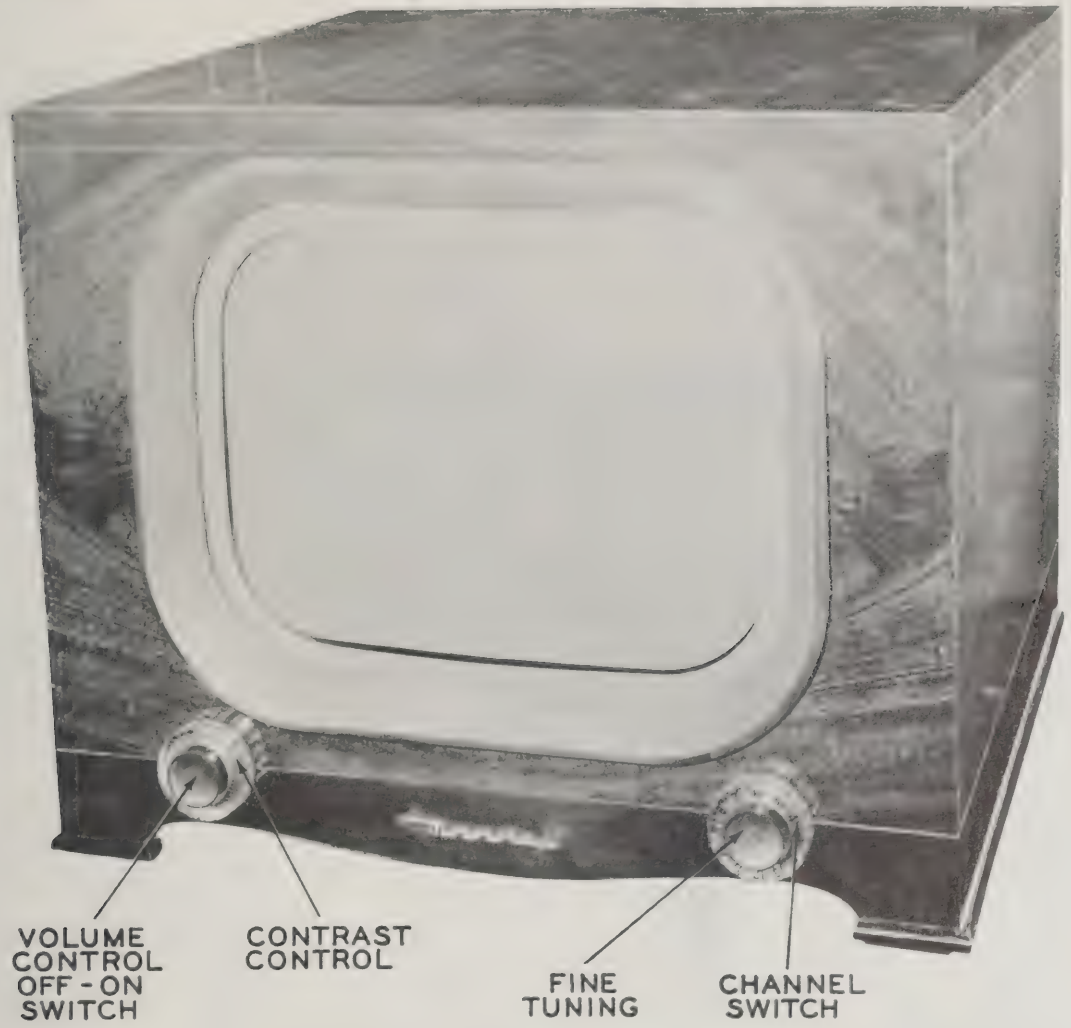

MOTOROLA MODELS 14K1, B, 14T1, B (Ch. TS-88)

MOTOROLA MODEL 14T1

TRADE NAME	Motorola, Models 14K1, 14K1B, 14T1, 14T1B (Chassis TS-88)
MANUFACTURER	Motorola Inc., 4545 Augusta Blvd., Chicago 51, Ill.
TYPE SET	Television Receiver
TUBES	Twenty
POWER SUPPLY	110 - 120 Volts AC - 60 Cycle
RATING	1.6 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13

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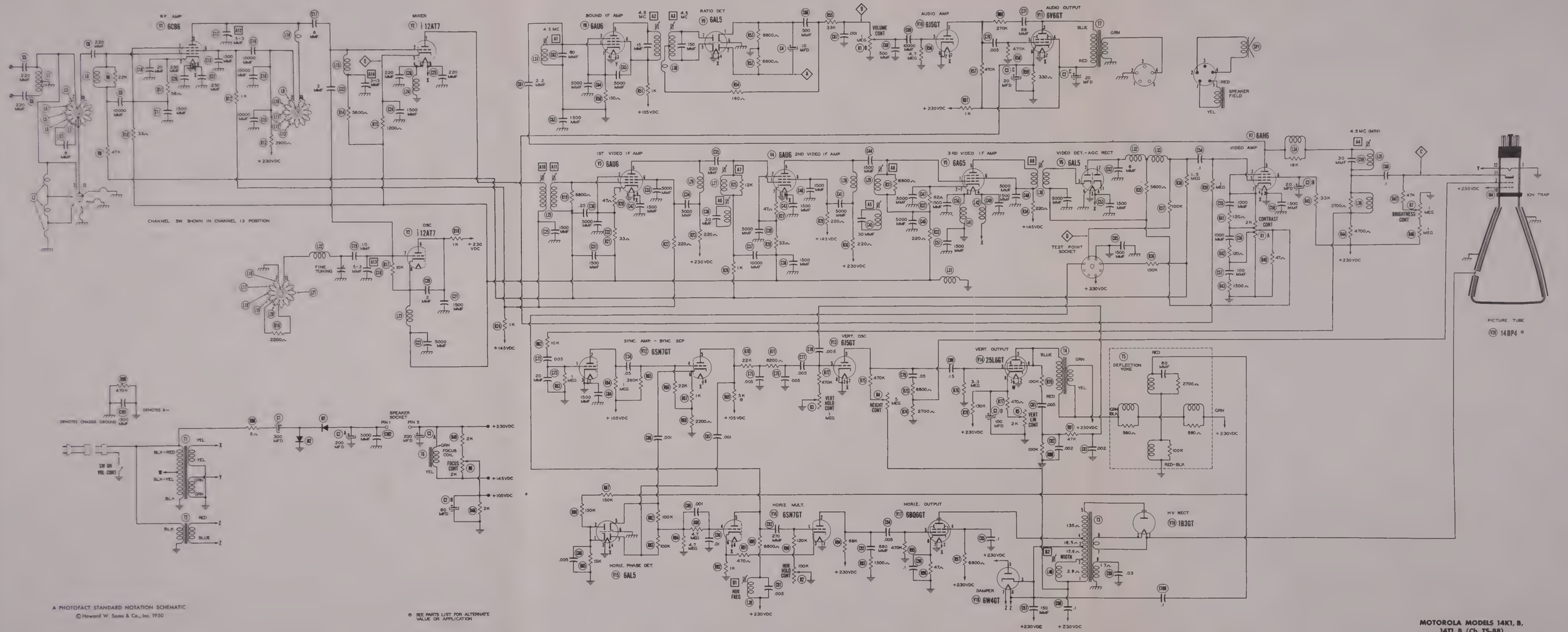
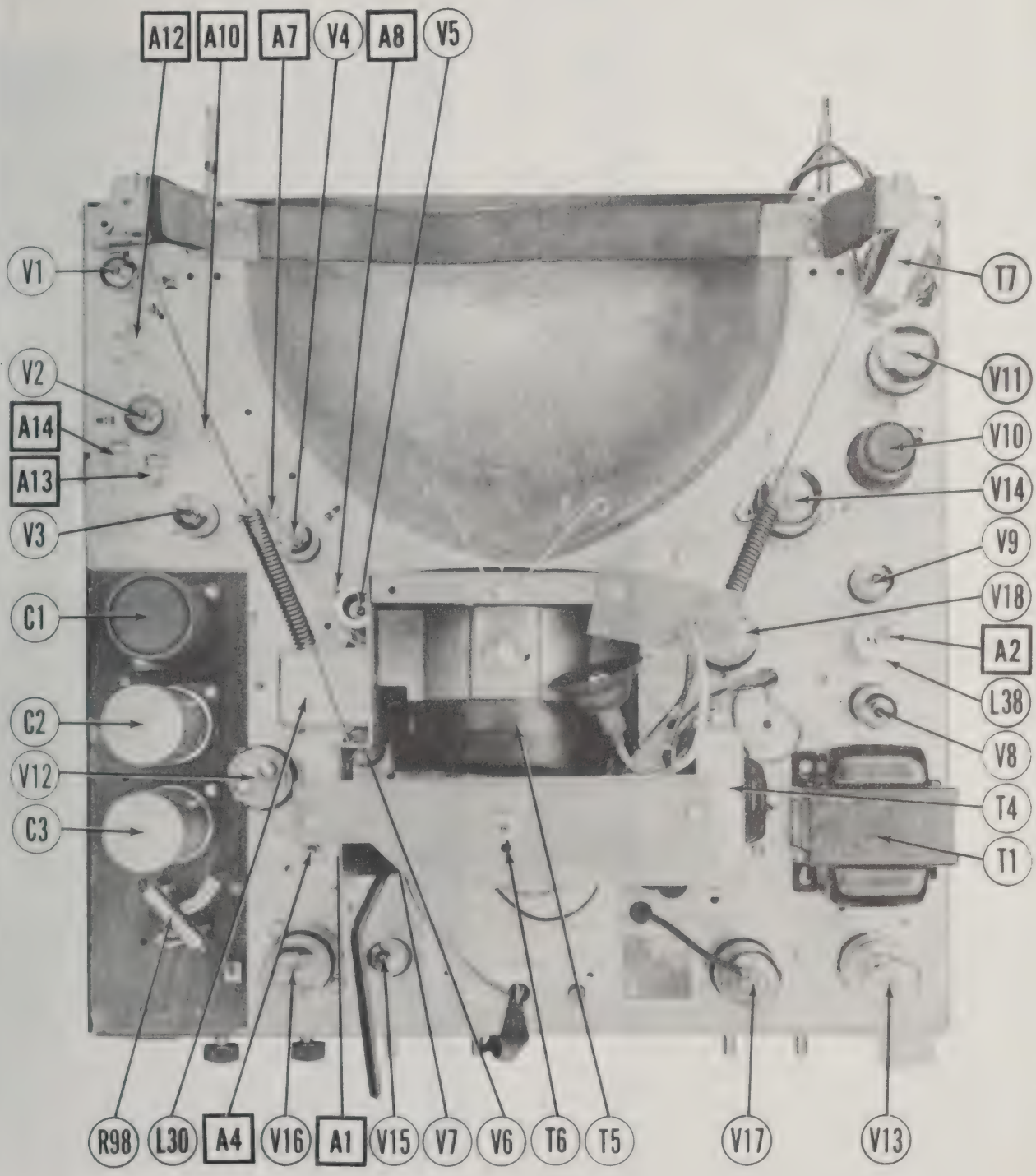
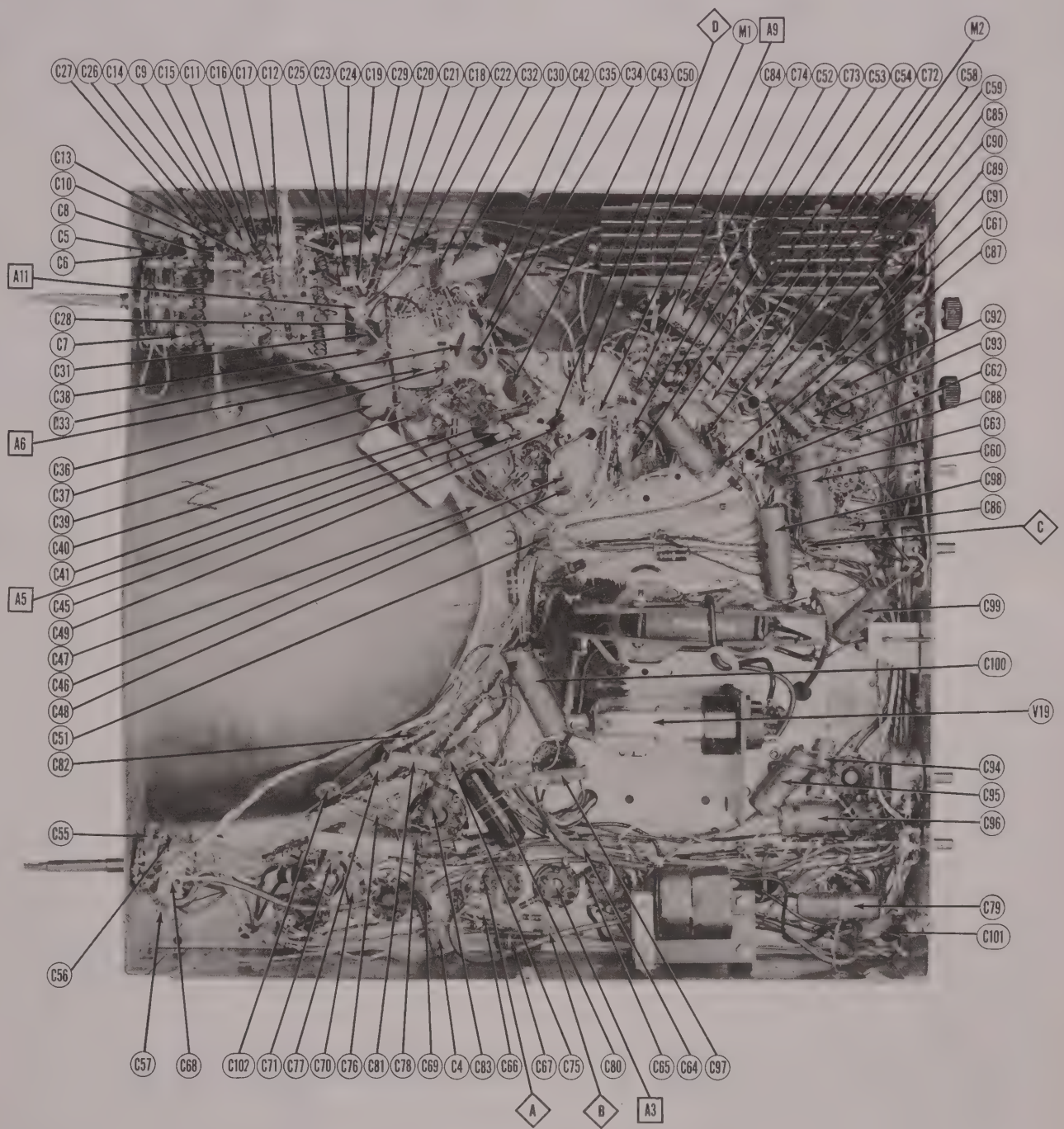


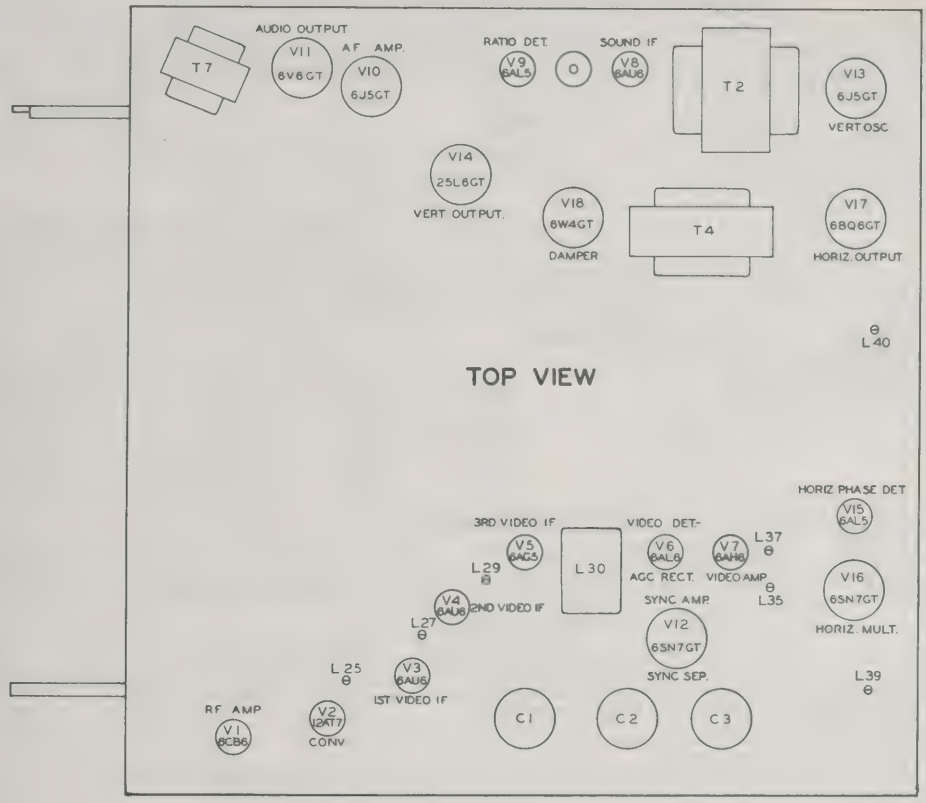
MOTOROLA MODELS 14K1, B, 14T1, B (Ch. TS-88)

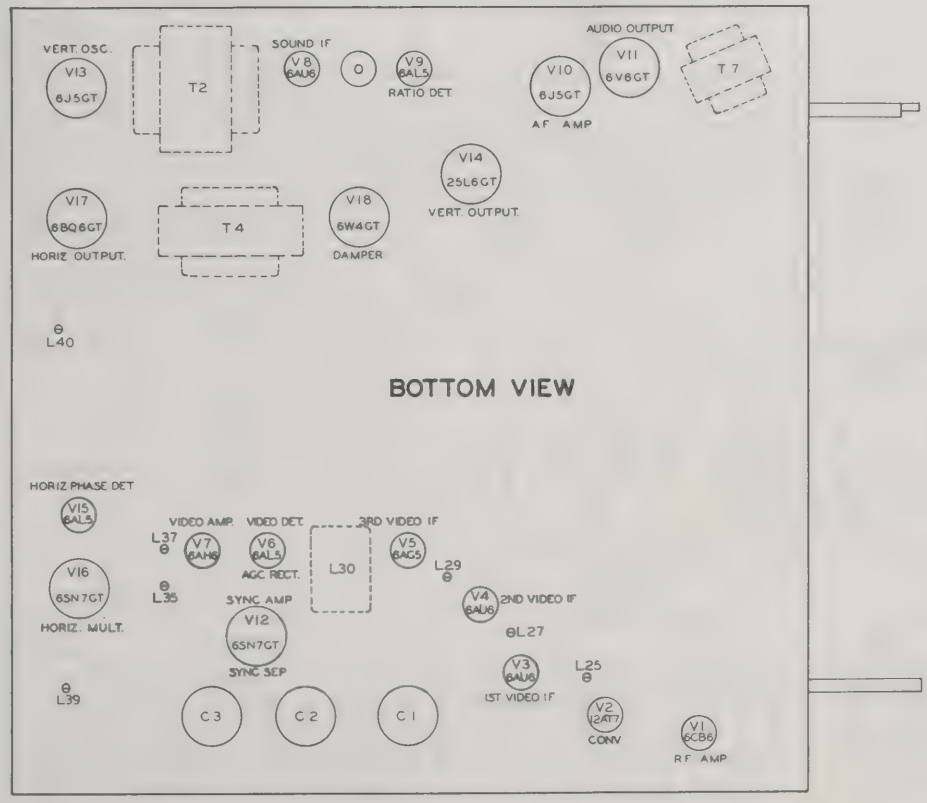


CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW-CAPACITOR AND ALIGNMENT IDENTIFICATION





TUBE PLACEMENT CHART

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

To prevent the high voltage shock hazard remove the horizontal output tube (V17) from its socket.
Use isolation transformer if available. If not connect a .1MFD capacitor in series with low side of signal generator and B-.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Turn the contrast control fully clockwise.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	.001MMF	High side to pin 1 (Grid) of 6AH6 (V7). Low side to B-.	4.5MC (Unmod.)	Any	DC Probe to Point (A). Common to B-.	A1, A2	Adjust for maximum deflection.
2.	.001MMF	"	"	"	DC Probe to Point (B). Common to B-.	A3	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60 ∿ modulation and 450KC sweep. Use 120 ∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	.001MFD	High side to pin 1 (Grid) of 6AH6 (V7). Low side to B-.	4.5MC (450KC SWP)	4.5MC	Any	Vert. Amp. to Point (A). Low side to B-.	A1, A2	Disconnect stabilizer capacitor C4. Adjust for maximum amplitude and symmetry as per figure 1.
2.	.001MFD	"	"	"	"	Vert. Amp. to Point (B). Low side to B-.	A3	Reconnect capacitor C4. Adjust A3 to place 4.5MC at center of crossover lines as per figure 2. SLIGHTLY retouch A2 for maximum amplitude and straightness of crossover lines.

4.5MC TRAP ADJUSTMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
3.	.001MFD	High side to pin 1 (Grid) of 6AH6 (V7). Low side to B-.	4.5MC	Any	DC Probe thru detector probe as shown in figure 3 to Point (C). Common to B-.	A4	Adjust for MINIMUM deflection.

VIDEO IF ALIGNMENT

To prevent erroneous indications, disconnect the 1000Ω resistor (R18) from the oscillator plate (pin 6) of the converter tube (V2).
Connect the negative terminal of a 3 volt battery to the junction of R19 and C30.
Connect the positive terminal to B-.
Connect a 10,000MMF ceramic disc type capacitor from the junction of L15 and R14 to B-.
Turn the contrast control fully counter-clockwise.
Connect the synchronized sweep voltage from the signal generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
4.	.005MFD	High side to pin 1 (Grid) of 6AU6 (V3). Low side to B-.	24.6MC (10MC SWP)	21.9MC	Any	Vert. Amp. to Point (D). Low side to B-.	A5	Adjust for maximum attenuation on response curve at the 21.9MC point on curve as shown in figure 4.
5.	.005MFD	"	"	27.3MC	"	"	A6	Adjust for maximum attenuation on response curve at the 27.3MC point on curve as shown in figure 4.
6.	.005MFD	"	"	26.6MC	"	"	A7	Adjust to place 26.6MC marker at 60% down on high side of response curve as shown in figure 4.
7.	.005MFD	"	"	22.7MC	"	"	A8	Adjust to place 22.7MC marker at 60% down on low side of response curve as shown in figure 4.
8.	.005MFD	"	"		"	"	A9	Adjust for flat top or symmetrical response curve.
9.	.005MFD	High side to pin 2 (Grid) of 12AT7 (V2). Low side to B-.	"	21.9MC 22.9MC 26.4MC 27.3MC	"	"	A10, A11	Turn both cores fully out (counter-clockwise) then turn both in simultaneously until the 22.9MC and 26.4MC markers appear at 50% of response as shown in figure 5. If a dip occurs in response curve, it should not exceed 10%.

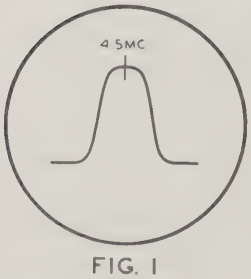


FIG. 1

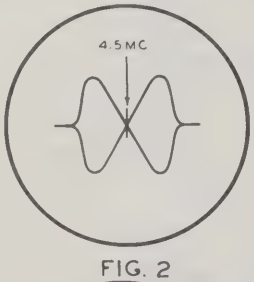


FIG. 2

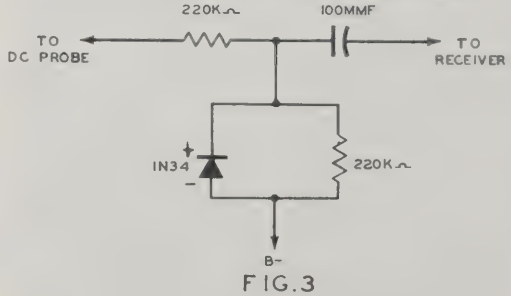


FIG. 3

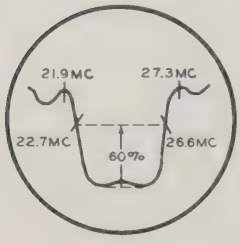


FIG. 4

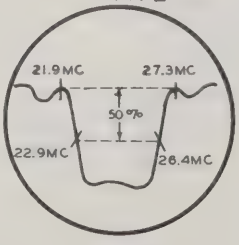


FIG. 5

MIXER "LC" ADJUSTMENT

Remove the 10,000MMF capacitor from the junction of L15 and R14. Connect the sweep generator and oscilloscope as in step 9 of Video IF Alignment. Adjust the LC trimmer A14 to the point at which the top of the IF response curve straightens out. Increasing the capacity will pull down the response curve on the high side. Decreasing the capacity will pull down the respsonse curve on the low side.. CAUTION....Tuning the LC circuit very low will cause oscillation.

ALIGNMENT INSTRUCTIONS (CONT.)

ANTENNA AND RF ALIGNMENT

Connect a short from junction of R19 and C30 to B-.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
10.	Direct	Across antenna terminals	195MC (10MC SWP)	193.25MC 197.75MC	10	Vert. Amp. thru 150KΩ to Point (E). Low side to B-.	A12	Adjust for response curve similar to figure 6. with markers as shown.
11.	Direct	"	213MC (10MC SWP)	211.25MC 215.75MC	13	"	L14	Check all high band channels for response curve similar to figure 6. If necessary expand or compress coil turns of L14 for proper response on channels 11, 12 and 13. If L14 is adjusted repeat steps 10 and 11.
			207MC (10MC SWP)	205.25MC 209.75MC	12			
			201MC (10MC SWP)	199.25MC 203.75MC	11			
			189MC (10MC SWP)	187.25MC 191.75MC	9			
			183MC (10MC SWP)	181.25MC 185.75MC	8			
			177MC (10MC SWP)	175.25MC 179.75MC	7			
12.	Direct	"	85MC (10MC SWP)	83.25MC 87.75MC	6	"	L7 L13	Expand or compress coil turns for response curve similar to figure 7 with markers as shown. Note that the antenna coil effects the position of the video marker and the RF coil effects the position of the sound marker.
			79MC (10MC SWP)	77.25MC 81.75MC	5		L6 L12	
			69MC (10MC SWP)	67.25MC 71.75MC	4		L5 L11	
			63MC (10MC SWP)	61.25MC 65.75MC	3		L4 L10	
			57MC (10MC SWP)	55.25MC 59.75MC	2		L3 L9	

OSCILLATOR ALIGNMENT

Reconnect the 1000Ω resistor to pin 6 of the converter tube (V2).
Remove short from junction of R19 and C30 and connect battery as in Video IF Alignment.
Turn the contrast control fully counter-clockwise.
Remove the knob from the fine tuning shaft and turn shaft until slot is in horizontal position.
As the oscillator is tuned on channels 7, 8, 9 and 10 it is tuned below the carrier frequency, therefore the frequencies on the response curve will be reversed.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
13.	Direct	Across antenna terminals.	207MC (10MC SWP)	209.75MC	12	Vert. Amp. to Point (D). Low side to B-.	A13	Adjust to place sound marker at the 21.9MC trap on response curve as shown in figure 8.
14.	Direct	"	189MC (10MC SWP)	191.75MC	9	"	L21	Expand or compress coil turns to place sound marker at the 27.3MC trap on response curve as shown in figure 9. Repeat steps 13 and 14 until no further improvement can be made.
			183MC (10MC SWP)	185.75MC	8			
			177MC (10MC SWP)	179.75MC	7			
15.	Direct	"	213MC (10MC SWP)	215.75MC	13	"		Check to see if sound marker can be placed at the 21.9MC trap on the response curve within a 30° rotation of the fine tuning, shaft from the horizontal position. If more than a 30° rotation is required adjust L22 by expanding or compressing coil turns until the 30° requirement is met. If L22 is adjusted it will be necessary to recheck the adjustment of A13 in step 13.
16.	Recheck channels 7 thru 12 to see if the sound marker for each channel can be placed in the trap "notch" within the 30° rotation of the fine tuning shaft from the horizontal position. If one of the channels does not meet the 30° requirement, a compromise must be made by readjusting channels 9 or 12, (as in step 13 or 14) which ever is closer to the channel in question. For example: If channel 11 does not meet the 30° requirement, turn the channel selector and sweep generator to channel 12. Adjust A13 toward channel 11 (by tightening screw). This will move the channel 12 sound marker out of the trap "notch", but can be compensated for by adjustment of the fine tuning trimmer. Do not adjust A13 any more than necessary to get the channel in question within the 30° requirement. If the channel in question should be channel 10, turn the channel selector and signal generator to channel 9 and adjust L21 toward channel 10 (by expanding coil turns). This will also move the channel 9 sound marker out of the trap "notch" but will be compensated for by adjustment of the fine tuning trimmer. Do not adjust L21 more than necessary to get the channel in question within the 30° requirement.							
17.	Direct	Across antenna terminals.	85MC (10MC SWP)	87.75MC	6	Vert. Amp. to Point (D). Low side to B-.	L20	Expand or compress coil turns to place sound marker at the 21.9MC "notch" on response curve as shown in figure 8 with the fine tuning shaft in the horizontal position.
18.	Direct	"	79MC (10MC SWP)	81.75MC	5	"	L19	Expand or compress coil turns to place sound marker at the 21.9MC "notch" on response curve as shown in figure 8 with the fine tuning shaft set no more than 15° rotation from the horizontal position.
19.	Direct	"	69MC (10MC SWP)	71.75MC	4	"	L18	"
20.	Direct	"	63MC (10MC SWP)	65.75MC	3	"	L17	Expand or compress coil turns to place sound marker at the 21.9MC trap "notch" as shown in figure 8 with the fine tuning shaft no more than 75° rotation from the horizontal position.
21.	Direct	"	57MC (10MC SWP)	59.75MC	2	"	L16	"

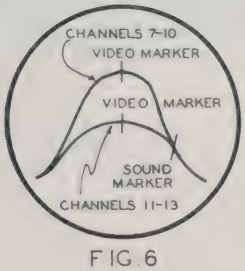


FIG.6

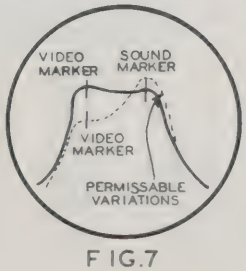


FIG.7

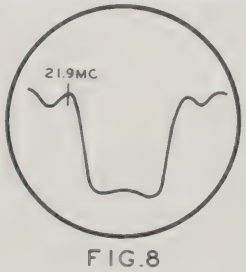


FIG.8

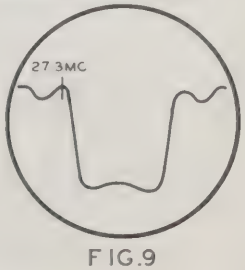


FIG.9

VOLTAGE AND RESISTANCE MEASUREMENTS

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6CB6	.4VDC	1.6VDC	0V.	6.3VAC	175VDC	125VDC	.6VDC		
V 2	12AT7	130VDC	-.7VDC	2VDC	0V.	0V.	220VDC	§-4.5VDC	0V.	6.3VAC
V 3	6AU6	.9VDC	.6VDC	0V.	6.3VAC	225VDC	130VDC	1.5VDC		
V 4	6AU6	.9VDC	.6VDC	0V.	6.3VAC	225VDC	145VDC	1.5VDC		
V 5	6AG5	2.4VDC	3.4VDC	0V.	6.3VAC	145VDC	145VDC	3.4VDC		
V 6	6AL5	0V.	.6VDC	0V.	6.3VAC	.9VDC	0V.	0V.		
V 7	6AH6	2VDC	9.7VDC	0V.	6.3VAC	175VDC	120VDC	9.7VDC		
V 8	6AU6	0V.	1VDC	6.3VAC	0V.	100VDC	100VDC	1VDC		
V 9	6AL5	.1VDC	-.1VDC	0V.	6.3VAC	-.1VDC	0V.	.1VDC		
V 10	6J5GT	0V.	0V.	15VDC	0V.	-.5VDC	0V.	6.3VAC	0V.	
V 11	6V6GT	0V.	6.3VAC	185VDC	195VDC	0V.	0V.	0V.	11VDC	
V 12	6SN7GT	-1.4VDC	7.5VDC	0V.	18VDC	80VDC	18VDC	0V.	6.3VAC	
V 13	6J5GT	0V.	0V.	200VDC 20VDC	0V.	-2.6VDC -4VDC	0V.	6.3VAC	0V.	
V 14	25L6GT	0V.	0V.	220VDC	220VDC	0V.	0V.	25VAC	20VDC 30VDC	
V 15	6AL5	.4VDC	.4VDC	0V.	6.3VAC	3.7VDC	0V.	-1.8VDC		
V 16	6SN7GT	-7VDC -4.7VDC	145VDC	8.2VDC	0V.	185VDC	7.6VDC	0V.	6.3VAC	
V 17	6BQ6GT	145VDC	6.3VAC	0V.	150VDC	-17VDC	0V.	0V.	4.4VDC	TOP CAP *
V 18	6W4GT	0V.	0V.	420VDC	0V.	230VDC	0V.	420VDC	420VDC	
V 19	1B3GT	* DO NOT MEASURE.								
V 20	14BP4	0V.	0V.	PIN 10 230VDC	PIN 11 0V. 110VDC	PIN 12 6.3VAC				

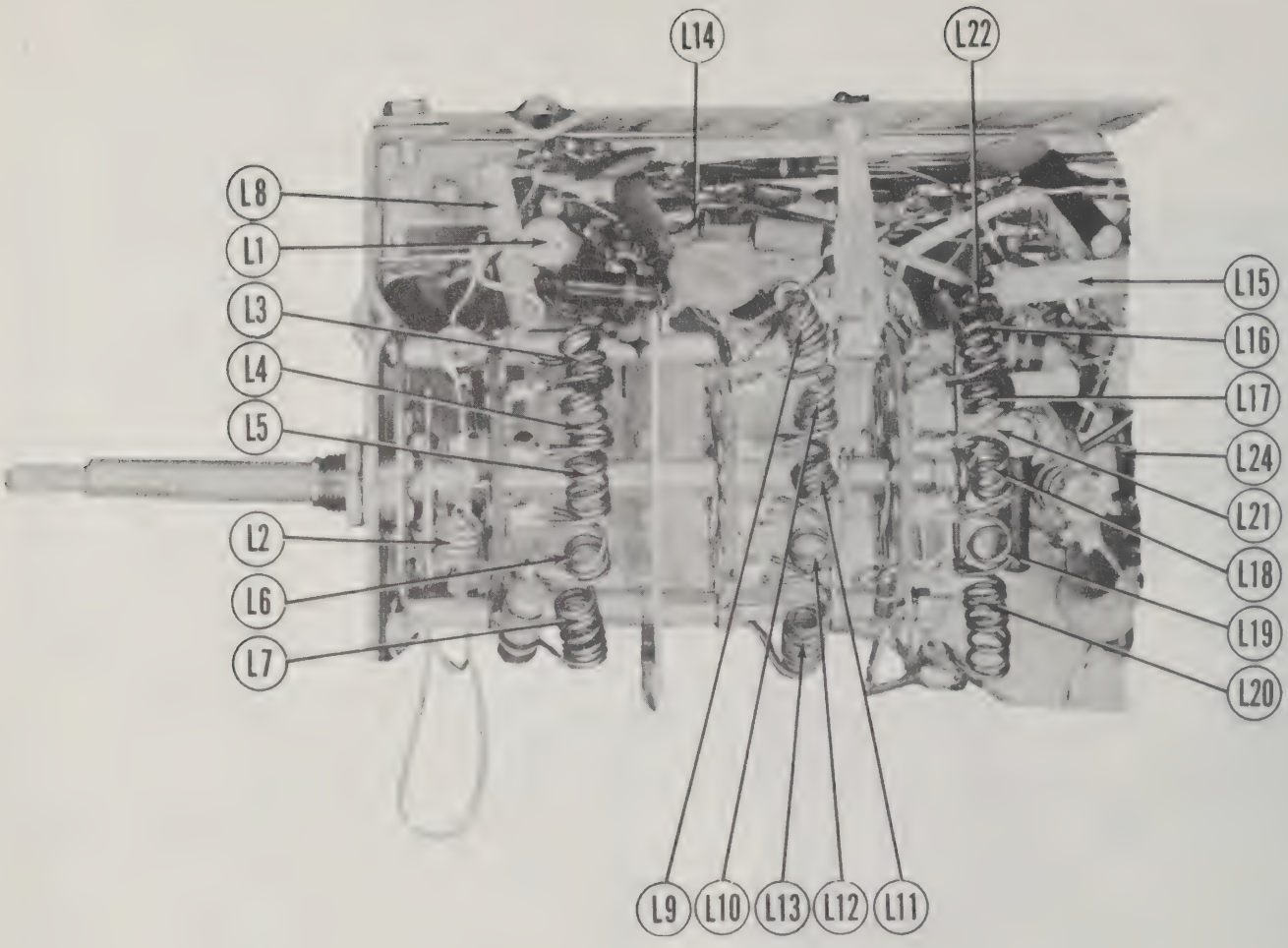
FOCUS CONTROL SET FULLY COUNTERCLOCKWISE FOR THESE MEASUREMENTS.
§ TAKEN WITH VACUUM TUBE VOLTMETER.
* DO NOT MEASURE.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6CB6	1.5 Meg.	90Ω	0Ω	.1Ω	†3.9KΩ	†3.6KΩ	33Ω		
V 2	12AT7	†2.6KΩ	5.6KΩ	1.2KΩ	.2Ω	.2Ω	†1000Ω	10KΩ	2.2Ω	.3Ω
V 3	6AU6	1.5 Meg.	33Ω	0Ω	.1Ω	†270Ω	†2.8KΩ	80Ω		
V 4	6AU6	1.5 Meg.	33Ω	0Ω	.1Ω	†270Ω	†1.8KΩ	80Ω		
V 5	6AG55	220Ω	300Ω	.2Ω	.3Ω	†1.8KΩ	†1.8KΩ	300Ω		
V 6	6AL5	Inf.	5.6KΩ	0Ω	.1Ω	1Ω	470KΩ	Inf.		
V 7	6AH6	1 Meg.	1.5KΩ	0Ω	.1Ω	†4.7KΩ	†33KΩ	1.5KΩ		
V 8	6AU6	1.2Ω	150Ω	.1Ω	0Ω	†2.5KΩ	†2.5KΩ	150Ω		
V 9	6AL5	6.8KΩ	6.8KΩ	0Ω	.1Ω	1 Meg.	470KΩ	1 Meg.		
V 10	6J5GT	470KΩ	0Ω	†470KΩ	25Ω	4.7 Meg.	Inf.	.1Ω	0Ω	
V 11	6V6GT	Inf.	.1Ω	†1.3KΩ	†1000Ω	470KΩ	0Ω	0Ω	330Ω	
V 12	6SN7GT	1 Meg.	† 1 Meg.	0Ω	25KΩ	†6.5KΩ	3.2KΩ	0Ω	.1Ω	
V 13	6J5GT	470KΩ	0Ω	#470KΩ #5.5Meg.	2.7KΩ	470KΩ 1.5 Meg.	9.5KΩ	.1Ω	0Ω	
V 14	25L6GT	150KΩ	0Ω	†650Ω	†650Ω	3.3 Meg.	Inf.	1.3Ω	2.5KΩ 470Ω	
V 15	6AL5	15KΩ	15KΩ	0Ω	.1Ω	4.8 Meg.	470KΩ	4.8 Meg.		
V 16	6SN7GT	100KΩ 220KΩ	†68KΩ	1.5KΩ	9 Meg.	†7.8KΩ	1000Ω	0Ω	.1Ω	
V 17	6BQ6GT	†68KΩ	.1Ω	Inf.	†6.8KΩ	470KΩ	Inf.	0Ω	47Ω	TOP CAP #16Ω
V 18	6W4GT	Inf.	Inf.	Inf.	Inf.	†47Ω	Inf.	#.6Ω	#0Ω	
V 19	1B3GT	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	TOP CAP #150Ω
V 20	14BP4	0Ω	2.7KΩ	PIN 10 †47Ω	PIN 11 500KΩ 47KΩ	PIN 12 .1Ω				

FOCUS CONTROL SET FULLY COUNTERCLOCKWISE FOR THESE MEASUREMENTS.
† MEASURED FROM OUTPUT OF M1.
# MEASURED FROM PIN 3OF V18.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltage measured at 1,000 ohms.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. Front panels controls set at minimum.
6. Where readings may vary according to the setting of the service controls, both minimum and maximum readings are given.

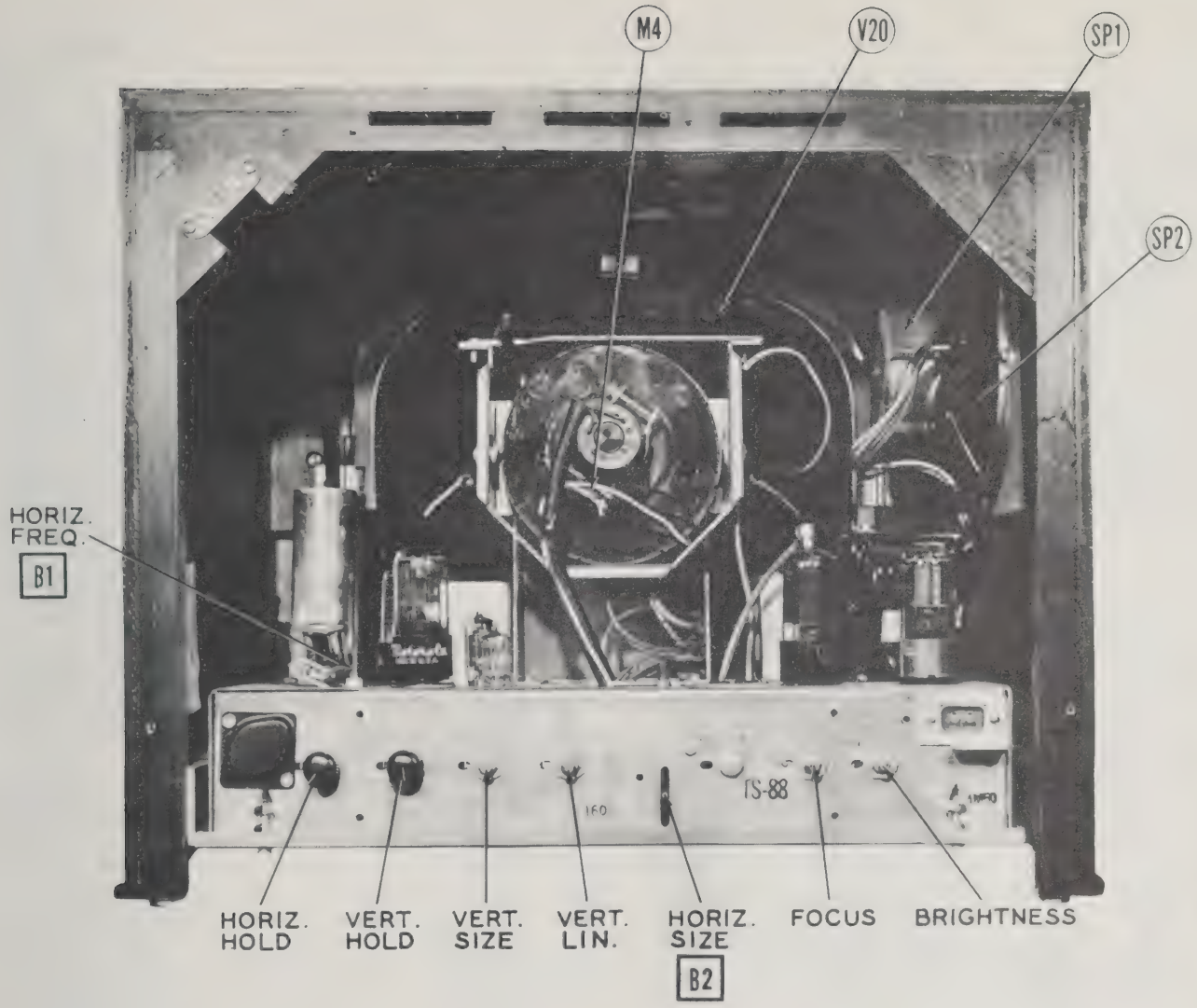


RF SECTION-BOTTOM VIEW

DISASSEMBLY INSTRUCTIONS

1. Remove four push-on type control knobs.
2. Remove seven wood screws holding rear cover in place.
3. Disconnect built-in antenna.
4. Remove antenna terminal strip.
5. Disconnect speaker leads.
6. Remove four hex head bolts holding chassis in cabinet. Remove chassis.
7. Reove four nuts holding speaker in cabinet. Remove speaker.

NOTE: To remove picture tube it is necessary to remove chassis from cabinet.



CABINET–REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the receiver on and turn in a TV station, preferably a test pattern.

Turn the horizontal hold control to the mid-position of its range and turn the horizontal frequency slug (B1) to the center point over which the picture synchronizes horizontally.

Adjust the horizontal size lever (B2) until the picture fills the mask horizontally.

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	NOTES
V1	RF Amp.	6CB6	6CB6	6CK	
V2	Converter	12AT7	12AT7	9A	
V3	1st Video IF	6AU6	6AU6	7BK	
V4	2nd Video IF	6AU6	6AU6	7BK	
V5	3rd Video IF	6AG5	6AG5	7BD	
V6	Video Det. -AGC Rect.	6AL5	6AL5	6BT	
V7	Video Amp.	6AH6	6AH6	7BK	
V8	Sound IF	6AU6	6AU6	7BK	
V9	Ratio Det.	6AL5	6AL5	6BT	
V10	Audio Amp.	6J5GT	6J5GT	6Q	
V11	Audio Output	6V6GT	6V6GT	7AC	
V12	Sync. Amp. -Sync. Sep.	6SN7GT	6SN7GT	8BD	
V13	Vert. Osc.	6J5GT	6J5GT	6Q	
V14	Vert. Output	25L6GT	25L6GT	7AC	
V15	Hor. Phase Det.	6AL5	6AL5	6BT	
V16	Hor. Mult.	6SN7GT	6SN7GT	8BD	
V17	Hor. Output	6BQ6GT	6BQ6GT	6AM	
V18	Damper	5W4GT	5W4GT	4CG	
V19	HV Rect.	1B3GT	1B3GT	3C	
V20A	Picture Tube	14BP4	14BP4	12D	
B	Picture Tube	14CP4	14CP4	12D	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CENTRALAB PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1	300	150	23B791692	AF4025D		UPE30015		TVL-1434	Voltage Doubler Cap.
C2A	200	300	23B791721	E4C225		UPT2030-2625		TVL-3563	▪ Filter
B	60	250							▪ Filter
C	20	250							▲ Decoupling
C3A	200	300	23B791741	E4D312		UPT406			▪ Filter
B	20	250							■ V. Amp. Screen
C	20	25							▲ Output Cath.
D	100	50							Vert. Output Cath. Stabilizing Cap.
C4	10	50	23A90205	PRS50/10		BR106		TVA-1304	
C5	220		21K77375	SI220	D6-221		GP2K-220	19C13	Ant. Coupling
C6	220		21K77375	SI220	D6-221		GP2K-220	19C13	Ant. Coupling
C7	8		21K478234	SI8.2NPO			NPOK-8.2		Fixed Trimmer
C8	220		21K77375	SI220	D6-221		GP2K-220	19C13	RF Coupling
C9	10000		21K482726	BPD-01	DD-103		811-01	36C1	AGC Filter
C10	20		21K470323	SI20	D6-200		GP1K-20	19C23	RF Cathode
C11	1500		21A470790	BPD-0015	DD-152		811-0015	19C20	RF Cathode
C12	.5-3		LK790189		829-3				Variable Trimmer
C13	1500		21A470790	BPD-0015	DD-152		811-0015	19C20	RF Screen
C14	10000		21K482726	BPD-01	D6-103		811-01	36C1	RF Plate Dec.
C15	10000		21K482726	BPD-01	D6-103		811-01	36C1	RF Plate Dec.
C16	10300		21K482726	BPD-01	D6-103		811-01	36C1	RF Plate Dec.
C17	8		21K478234	SI8.2NPO			NPOK-8.2		RF Coupling
C18	.5-3		LK790189		829-3				Variable Trimmer
C19	10		21K400173			N1400K-10			Fixed Padder
C20	2		21K478280		TCZ-2.2				Osc. Feedback
C21	1500		21A470790	BPD-0015	D6-152		811-0015	19C20	Osc. Plate Bypass
C22	5000		21A470789	BPD-005	DD-502		811-005	29C1	RF Bypass
C23	2		21K478280		TCZ-2.2				Osc. Coupling
C24	1500		21A470790	BPD-0015	DD-152		811-0015	19C20	Mixer Cathode
C25	1500		21A470790	BPD-0015	DD-152		811-0015	19C20	Mixer Plate Dec.
C26	250		21B482295	SI250	D6-251		GP2K-250	19C13	RF Fil. Bypass
C27	250		21B482295	SI250	D6-251		GP2K-250	19C13	RF Fil. Bypass
C28	220		21K77375	SI220	D6-221		GP2K-220	19C13	Conv. Fil. Bypass
C29	220		21K77375	SI220	D6-221		GP2K-220	19C13	Conv. Fil. Bypass
C30	25	100	8R9810	P488-25		GT2P25		2TM-P25	AGC Filter
C31	1500		21A470790	BPD-0015	DL-152	1W5D15	811-0015	19C20	AGC Filter
C32	5000		21A470789	BPD-005	DD-502	1D5D5	811-005	29C1	1st V. IF Cath.
C33	5000		21A470789	BPD-005	DD-502	1D5D5	811-005	29C1	1st V. IF Screen
C34	5000		21A470789	BPD-005	DD-502	1D5D5	811-005	29C1	1st V. IF Plate Dec.
C35	220		21K77375	SI220	D6-221	5W5T25	GP2K-220	19C13	IF Coupling
C36	10		21K470329				N150K-30		Fixed Trimmer
C37	10000		21K482726	BPD-01	DD-103	PTE4S1	811-01	36C1	AGC Filter
C38	1500		21A470790	BPD-0015	DD-152	1W5D15	811-0015	19C20	RF Bypass
C39	5000		21A470789	BPD-005	DD-502	1D5D5	811-005	29C1	2nd V. IF Cath.
C40	1500		21A470790	BPD-0015	DD-152	1W5D15	811-0015	19C20	2nd V. IF Screen
C41	5000		21A470789	BPD-005	DD-502	1D5D5	811-005	29C1	2nd V. IF Plate Dec.
C42	1500		21A470790	BPD-0015	DD-152	1W5D15	811-0015	19C20	1st V. IF Fil.
C43	1500		21A470790	BPD-0015	DD-152	1W5D15	811-0015	19C20	2nd V. IF Fil.
C44	1500		21A470790	BPD-0015	DD-152	1W5D15	811-0015	19C20	IF Coupling
C45	30		21K470329				N150K-30		Fixed Trimmer
C46	5000		21A470789	BPD-005	DD-502	1D5D5	811-005	29C1	3rd V. IF Cath.
C47	5000		21A470789	BPD-005	DD-502	1D5D5	811-005	29C1	3rd V. IF Cath.
C48	5000		21A470789	BPD-005	DD-502	1D5D5	811-005	29C1	3rd V. IF Dec.
C49	1500		21A470790	BPD-0015	DD-152	1W5D15	811-0015	19C20	3rd V. IF Fil.
C50	1500		21A470790	BPD-0015	DD-152	1W5D15	811-0015	19C20	3rd V. IF Fil.
C51	1500		21A470790	BPD-0015	DD-152	1W5D15	811-0015	19C20	RF Bypass
C52	8		21K470324	SI8.5NPO	TCZ-6.8	5W5V5	NPOK-6.8	19C19	V. Diode Filter
C53	1500		21A470790	BPD-0015	DD-152	1W5D15	811-0015	19C20	V. Det. Fil.
C54	.1	200	8R9854	P288-1	DF-104	PTE4P1		2TM-P1	Video Coupling
C55	1000		21K780599	SI1000	D6-102	1W5D1	GP1L-001	19C1	V. Amp. Cath.
C56	1000		21K780599	SI1000	D6-102	1W5D1	GP1L-001	19C1	V. Amp. Cath.
C57	100		21B77386	SI100	D6-101	5W5T1	GP1K-100	19C11	V. Amp. Cath.
C58	1500		21A470790	BPD-0015	DD-152	1W5D15	811-0015	19C20	V. Amp. Fil.
C59	30		21K470329				N150K-30		Fixed Trimmer
C60	.1	600	8R9874		P688-1	DF-104	PTE6P1	6TM-P1	Video Coupling
C61	2.2		21A478274			TCZ-2.2			S. IF Coupling
C62	60		21K790683			TCN-62		N750L-60	Fixed Trimmer
C63	1500		21A470790	BPD-0015	DD-152	1W5D15	811-0015	19C20	RF Bypass
C64	5000		21A470789	BPD-005	DD-502	1D5D5	811-005	29C1	S. IF Cath.
C65	5000		21A470789	BPD-005	DD-502	1D5D5	811-005	29C1	S. IF Decoup.

CAPACITORS (CONT.)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CENTRALAB PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C66	500	500	21R6590	1468-0005	D6-501	5W5T5	GP2K-500	1FM-35	Diode Load Cap.
C67	.001	600	8R9866	P688-001	D6-102	PTE6D1	GP2L-001	6TM-D1	De-emphasis
C68	500	500	21R6590	1468-0005	D6-501	5W5T5	GP2K-500	1FM-35	Tone Comp.
C69	10000		21K482726	BPD-01	DD-103	PTE6S1	811-01	36C1	Audio Coupling
C70	.005	600	8R9869	P688-005	D6-502	PTE6D5	811-005	6TM-D5	Audio Coupling
C71	68	500	21R6650	SI68	D6-680	5W5Q7	GP1K-68	19C10	Tone Comp.
C72	.005	600	8R9869	P688-005	D6-502	PTE6D5	811-005	6TM-D5	Sync. Coupling
C73	20		21K470322	SI20	D6-200	5W5Q2	GP1K-20	19C23	1st Sync. Amp. Grid
C74	.05	600	8R9873	P688-05	DF-503	PTE6S5		6TM-S5	Sync. Coupling
C75	.005	600	8R9869	P688-005	D6-502	PTE6D5	811-005	6TM-D5	Integrator Net.
C76	.005	600	8R9869	P688-005	D6-502	PTE6D5	811-005	6TM-D5	Integrator Net.
C77	.005	600	8R9869	P688-005	D6-502	PTE6D5	811-005	6TM-D5	Vert. Sync. Coupling
C78	.006	600	8R790026	P688-005	D6-502	PTE6D5	811-005	6TM-D5	Vert. Feedback
C79	.05	600	8R9873	P688-05		PTE6S5		6TM-S5	Vert. Discharge
C80	.15	400	8R9875	P488-15		GT4P2		4TM-P15	Vert. Sweep Coupling
C81	.005	600	8R9869	P688-005	D6-502	PTE6D5	811-005	6TM-D5	Vert. Sweep Coupling
C82	.002	600	8R9867	P688-002	D6-202	PTE6D2	GP2M-002	6TM-D2	Voltage Divider
C83	.002	600	8R9867	P688-002	D6-202	PTE6D2	GP2M-002	6TM-D2	Integrator Net.
C84	1500		21A470790	BPD-0015	DD-152	1W5D15	811-0015	19C20	RF Bypass
C85	1500		21A470790	BPD-0015	DD-152	1W5D15	811-0015	19C20	RF Bypass
C86	.001	600	8R9866	P688-001	D6-102	PTE6D1	GP2L-001	6TM-D1	Hor. Sync. Coupling
C87	.001	600	8R9866	P688-001	D6-102	PTE6D1	GP2L-001	6TM-D1	Hor. Sync. Coupling
C88	.005	600	8R9869	P688-005	D6-502	PTE6D5	811-005	6TM-D5	Voltage Divider
C89	.001	600	8R9866	P688-001	D6-102	PTE6D1	GP2L-001	6TM-D1	AFC Filter
C90	.01	600	8R9870	P688-01	D6-103	PTE6S1	811-01	6TM-S1	AFC Filter
C91	.005	600	8R9869	P688-005	D6-502	PTE6D5	811-005	6TM-D5	Fixed Trimmer
C92	270		21K400037	SI270	D6-271	5W5T25	GP2K-270	19C31	Hor. MV Feedback
C93	680	500	21R2741	SI680	D6-681	1W5D7	GP2K-680	19C17	Hor. Discharge
C94	.005	600	8R9869	P688-005	D6-502	PTE6D5	811-005	6TM-D5	Hor. Sweep Coupling
C95	.1	600	8R9874	P688-1	DF-104	PTE6P1		6TM-P1	Hor. Output Screen
C96	.1	200	8R9854	P288-1	DF-104	PTE4P1		2TM-P1	Hor. Output Cath.
C97	150	3000	21K700630						Fixed Trimmer
C98	.1	600	8R9874	P688-1		PTE6P1		6TM-P1	Damper Filter
C99	.03	600	8R9872	P688-03		PTE6S3		6TM-S3	Fixed Trimmer
C100	.1	600	8R9874	P688-1	DF-104	PTE6P1		6TM-P1	Hor. Sweep Coupling
C101	1500		21A470790	BPD-0015	DD-152	1W5D15	811-0015	19C20	RF Bypass
C102	5000		21A470789	BPD-005	DD-502	1D5D5	811-005	29C1	RF Bypass

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: IRC PART No.	REPLACEMENT DATA: CLAROSTAT PART No.	REPLACEMENT DATA: CENTRALAB PART No.	INSTALLATION NOTES
R1A	2000Ω	½	18A792009		RTV-112		Contrast control-tapped at 1500Ω, 1750Ω, panel
B	1 Meg.	½					Volume control and switch-rear
R2A	100KΩ	½	18A791574	Q11-128	AG-49-8	B-40	Horiz. hold control
B	Shaft		Not Req.	Not Req.	RS-2	Not Req.	Attach to R2A per instructions
R3A	1 Meg.	½	18A90147	Q11-137	AG-61-8	B-69	Vert. hold control
B	Shaft		Not Req.	Not Req.	RS-2	Not Req.	Attach to R3A per instructions
R4A	5 Meg.	½	18A90145	Q11-141	AG-85-8	B-87	Vert. size control
B	Shaft		Not Req.	Not Req.	RS-2	Not Req.	Attach to R4A per instructions
R5	2000Ω	2	18A790146	W-2000	43-2000	VK-131	Vert. linearity control-Wire Wound
R6	2000Ω	4	18A790162		RTV-129	SVP-998	Focus Control-Wire Wound
R7A	1 Meg.	½	18A90147	Q11-137	AG-61-8	B-69	Brightness control
B	Shaft		Not Req.	Not Req.	RS-2	Not Req.	Attach to R7A per instructions

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES ALL RESISTORS ARE ± 10% UNLESS OTHERWISE STATED.
R8	22KΩ	½	6R6397		RF Amp. Grid
R9	47KΩ	½	6R6377		AGC Network
R10	33Ω	½	6R2036		RF Amp. Cathode
R11	56Ω 20%	1	6R5614		RF Amp. Cathode
R12	1000Ω	½	6R6229	BTS-1000	RF Amp. Screen
R13	3900Ω	½	6R5659	BTS-3900	RF Amp. Plate Decoupling
R14	560Ω	½	6R6117		Mixer Grid
R15	1200Ω	½	6R6393	BTS-1200	Mixer Cathode
R16	2200Ω	½	6R6069	BTS-2200	Osc. Coil Shunt
R17	10KΩ	½	6R6320		Osc. Grid
R18	1000Ω	½	6R6229	BTS-1000	Osc. Plate
R19	6800Ω	½	6R6428		1st Video IF Transformer Shunt
R20	47Ω	½	6R5550		1st Video IF Amp. Cathode
R21	33Ω	½	6R2036		1st Video IF Amp. Cathode
R22	220Ω	½	6R6270	BTS-220	1st Video IF Amp. Screen
R23	220Ω	½	6R6270	BTS-220	1st Video IF Amp. Plate Decoupling
R24	1000Ω	½	6R6229	BTS-1000	Decoupling
R25	12KΩ	½	6R6394		2nd Video IF Transformer Shunt
R26	1000Ω	½	6R6229	BTS-1000	AGC Network
R27	47Ω	½	6R5550		2nd Video IF Amp. Cathode
R28	33Ω	½	6R2036		2nd Video IF Amp. Cathode
R29	220Ω	½	6R6270	BTS-220	2nd Video IF Amp. Screen
R30	220Ω	½	6R6270	BTS-220	2nd Video IF Amp. Plate Decoupling
R31	6800Ω	½	6R6428		3rd Video IF Transformer Shunt
R32	82Ω	½	6R2035	BTS-82	3rd Video IF Amp. Cathode
R33	220Ω	½	6R6270	BTS-220	Bias Network
R34	220Ω	½	6R6270	BTS-220	3rd Video IF Amp. Plate Decoupling
R35	5600Ω 20%	½	6R617	BTS-5600	Video Det. Diode Load
R36	100KΩ 20%	½	6R6031	BTS-100K	Series Test Point
R37	100KΩ	½	6R6031	BTS-100K	Series Test Point
R38	1.5 Meg.	½	6R6460	BTS-1.5 Meg.	AGC Network
R39	1 Meg. 20%	½	6R6004	BTS-1 Meg.	Video Amp.-Grid
R40	47Ω	½	6R5550	BW-½-47	Contrast Control Shunt
R41	120Ω	½	6R5551	BTS-120	Video Compensation
R42	120Ω	½	6R5551	BTS-120	Video Compensation
R43	1500Ω	½	6R6038	BTS-1500	Video Compensation
R44	4700Ω	2	6R5671	BTB-4700	Video Amp. Plate
R45	33KΩ	1	6R6400	BTA-33K	Video Amp. Screen

RESISTORS (CONT.)

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES
R46	1 Meg. 20%	½	6R6004	BTS-1 Meg.	Voltage Divider
R47	47KΩ	1	6R6048	BTA-47K	Voltage Divider
R48	2000Ω	10	17K792705	1 3/4A-2000	Bleeder-Wire Wound
R49	2000Ω	10	17K792705	1 3/4A-2000	Focus Coil Shunt-Wire Wound
R50	150Ω	½	6R6373	BTS-150	Sound IF Amp. Cathode
R51	1000Ω	½	6R6229	BTS-1000	Sound IF Amp. Decoupling
R52	6800Ω	½	6R6428	BTS-6800	Ratio Det. Diode Load
R53	6800Ω	½	6R6428	BTS-6800	Ratio Det. Diode Load
R54	180Ω	½	6R5660	BTS-180	Balancing
R55	33KΩ	½	6R6410	BTS-33K	De-emphasis
R56	4.7 Meg.	½	6R6446	BTS-4.7 Meg.	AF Amp. Grid
R57	470KΩ	½	6R6377	BTS-470K	AF Amp. Plate
R58	470KΩ	½	6R6377	BTS-470K	Audio Output Grid
R59	330Ω	½	6R6022	BTS-330	Audio Output Cathode
R60	270KΩ	½	6R6414	BTS-270K	Feedback
R61	1000Ω	2	6R3922	BTB-1000	Decoupling
R62	10KΩ	½	6R6320	BTS-10K	Isolation
R63	1 Meg. 20%	½	6R6004	BTS-1 Meg.	Sync. Amp. Grid
R64	1 Meg. 20%	½	6R6004	BTS-1 Meg.	Sync. Amp. Plate
R65	390KΩ	½	6R6446	BTS-390K	Voltage Divider
R66	22KΩ	½	6R6397	BTS-22K	Sync. Sep. Grid
R67	1000Ω	½	6R6229	BTS-1000	Sync. Sep. Cathode
R68	2200Ω	½	6R6069	BTS-2200	Sync. Sep. Cathode
R69	5000Ω 5%	1		BTA-4700-5%	Sync. Sep. Plate-See Note 1
R70	22KΩ	½	6R6397	BTS-22K	Integrator
R71	8200Ω	½	6R2004	BTS-8200	Integrator
R72	470KΩ 20%	½	6R6377	BTS-470K	Vert. Osc. Grid
R73	6800Ω	½	6R6428	BTS-6800	Vert. Peaking
R74	2700Ω	1	6R5577	BTA-2700	Picture Tube Grid
R75	470KΩ	½	6R6377	BTS-470K	Vert. Osc. Plate
R76	3.3 Meg.	½	6R6497	BTS-3.3 Meg.	Vert. Output Grid
R77	470Ω 20%	1	6R6090	BTA-470	Vert. Output Cathode
R78	150KΩ	½	6R6398	BTS-150K	Voltage Divider
R79	100KΩ	½	6R6031	BTS-100K	Voltage Divider
R80	100KΩ	½	6R6031	BTS-100K	Voltage Divider
R81	47KΩ	½	6R6048	BTS-47K	Voltage Divider
R82	100KΩ	½	6R6031	BTS-100K	Horiz. Phase Det. Load
R83	100KΩ	½	6R6031	BTS-100K	Horiz. Phase Det. Load
R84	4.7 Meg.	½	6R6446	BTS-4.7 Meg.	Horiz. Phase Det. Load
R85	15KΩ	½	6R6477	BTS-15K	Feedback Network
R86	150KΩ	1	6R5721	BTA-150K	Feedback Network
R87	150KΩ	1	6R5721	BTA-150K	Feedback Network
R88	4.7 Meg.	½	6R6446	BTS-4.7 Meg.	Horiz. AFC Filter Network
R89	6800Ω	½	6R6428	BTS-6800	Horiz. Mult. Plate
R90	120KΩ	½	6R5631	BTS-120K	Horiz. Mult. Grid
R91	470Ω	½	6R6090	BTS-470	Horiz. Mult. Cathode
R92	1000Ω	½	6R6229	BTS-1000	Horiz. Mult. Cathode
R93	1500Ω	½	6R6038	BTS-1500	Horiz. Peaking
R94	68KΩ	½	6R6074	BTS-68K	Horiz. Osc. Plate
R95	470KΩ 20%	½	6R6377	BTS-470K	Horiz. Output Grid
R96	47Ω	1	6R5583	BW-1-47	Horiz. Output Cathode
R97	6800Ω	2	6R5690	BTB-6800	Horiz. Output Screen
R98	5Ω	5	17A791696		Surge Limiter-Wire Wound
R99	470KΩ	½	6R6377	BTS-470K	Isolation

Note 1. Some models use a 4700Ω, 1/2 watt resistor in this application.

TRANSFORMER (FILAMENT)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.
T1	117VAC	6.3VAC	6.3VAC		25B791793			
	② 1.6A	③ 6.5A	③ .9A		25B700137 ①			
	Tap ③ 25VAC							
	③ .3A							
T2	117VAC	6.3VAC			25B790140			
	② .108A	③ 1.2A						

① Alternate part.

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING: DC RESISTANCE PRI.	RATING: DC RESISTANCE SEC.	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	NOTES
T3	170Ω	1.7Ω	24K700588				Hor. Output Trans.
	Tap ③ 2.9Ω, 18.5Ω, 35Ω	SEC. 2 0Ω					
T4	600Ω	11.5Ω	25B792168	A-8113 ②	A-3038 ②	TSO-5 ②	Vert. Output Trans.
T5A	37Ω		24C792506				Hor. Deflection Coil
B	62Ω		See Note 3				Vert. Deflection Coil
T6	1600Ω		24B700514				Focus Coil

② Drill one new mounting hole.
③ Alternate part numbers for T5. 24K70089, 24K700776, 24K792173, 24K700778, 24K700694, 24K792508, 24K700714, 24C700050, 24K700774, 24C792171.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	INSTALLATION NOTES
T7	4500Ω	3.6Ω	300Ω	.4Ω	25B790886	A-3877	A-2930	RO-9	

PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA			INSTALLATION NOTES
			MOTOROLA PART No.	JENSEN PART No.	QUAM PART No.	
	FIELD RES.	V. C. IMP.				
SP1A B	47Ω	3.6Ω	50K700636 ④ 50C791913 ⑤ 50K700669 ⑥		6E47S	④ Used in 14T1, 14T1B only. ⑤ Used in 14K1, 14K1B only. ⑥ Alternate speaker for SP1A.
	CONE DIA.	V. C. DIA.				
SP2A B	5 3/4"	9/16"	50K701616 ⑥			

COILS (RF-IF)

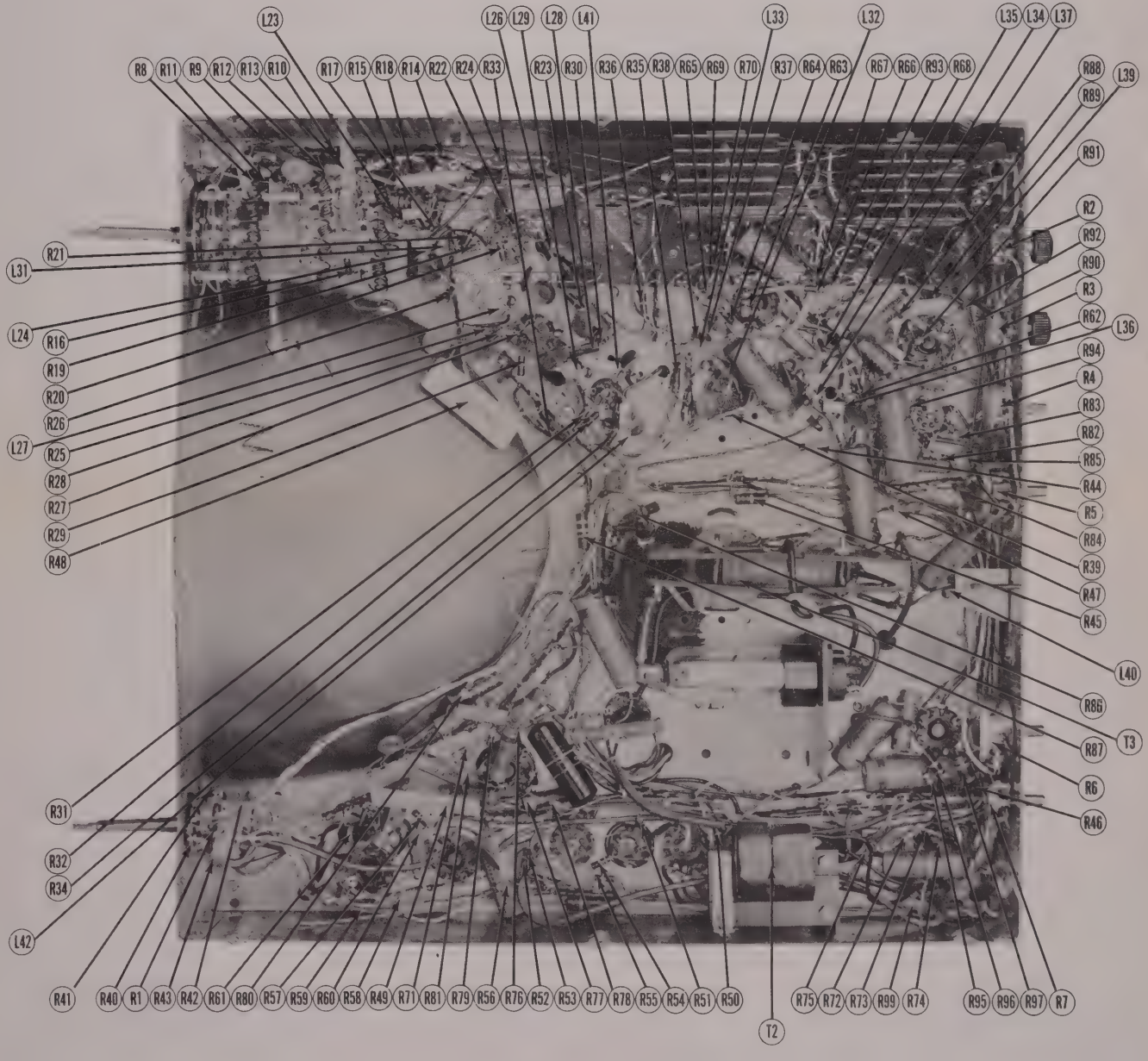
ITEM No.	USE	DC RES.		REPLACEMENT DATA			NOTES
		PRI.	SEC.	MOTOROLA PART No.	MEISSNER PART No.	IRC PART No.	
L1	Ant. Matching Coil	0Ω		24A790033			
L2	Ant. Coil	0Ω		24K792765			Primary- Low frequency
L3	Ant. Coil	0Ω		24C792764			Channel 2
L4	Ant. Coil	0Ω					Included with L3, channel 3
L5	Ant. Coil	0Ω					Included with L3, channel 4
L6	Ant. Coil	0Ω					Included with L3, channel 5
L7	Ant. Coil	0Ω					Included with L3, channel 6
L8	RF Choke	8Ω		24K791446		CL-1-10	10 microhenries
L9	RF Coil	0Ω		24K790536			Channel 2
L10	RF Coil	0Ω					Included with L9, channel 3
L11	RF Coil	0Ω					Included with L9, channel 4
L12	RF Coil	0Ω					Included with L9, channel 5
L13	RF Coil	0Ω					Included with L9, channel 6
L14	RF Coil	0Ω		24K792825			
L15	RF Choke	3.2Ω		24K792577		CL-1-3.3	3.3 microhenries
L16	Osc. Coil	0Ω		24C700114			Channel 2
L17	Osc. Coil	0Ω					Included with L16, channel 3
L18	Osc. Coil	0Ω					Included with L16, channel 4
L19	Osc. Coil	0Ω					Included with L16, channel 5
L20	Osc. Coil	0Ω					Included with L16, channel 6
L21	Osc. Coil	0Ω		24K700115			Channel 10
L22	Osc. Coil	0Ω		24K700116			Channel 13
L23	RF Choke	1.8Ω		24K780128		CLA-2.2	2.2 microhenries
L24	Fil. Choke	.2Ω		24K790145		CLA-.47	.47 microhenries
L25	1st Video IF	.4Ω	.4Ω	24K792578			Less cores and mounting nuts.
L26	RF Choke	3.4Ω		24K790035		CL-1-5.6	5.6 microhenries
L27	2nd Video IF	.4Ω		24B792586			Includes trap
L28	RF Choke	3.4Ω		24K790035		CL-1-5.6	5.6 microhenries
L29	3rd Video IF	.5Ω		24K792587			Includes trap
L30	4th Video IF	.6Ω	.6Ω	24B792585			Less core and mounting clip
L31	RF Choke	.2Ω		24K790145		CLA-.47	.47 microhenries
L32	Peaking	9.2Ω		24K792771			Yellow dot
L33	Peaking	4.4Ω		24K792772			Red-Green dots
L34	Peaking	11Ω		24A790579			Wound on 18KΩ resistor, red dot
L35	4.5MC Trap	2.5Ω		24B792735			Less core and mounting nut
L36	Peaking	19Ω		24A792588			Wound on 2700Ω resistor
L37	Sound IF	1.2Ω		24A470159			Less core and mounting nut
L38	Ratio Det. Trans.	3Ω	.4Ω	24B790125			Includes cores and clip, less shield
L39	Horiz. Osc.	160Ω		24K790059			Less core and clip
L40	Horiz. Size	16Ω		24K700089			Less core and clip
L41	Fil. Choke	.2Ω		24K790145		CLA-.47	.47 microhenries
L42	Fil. Choke	.2Ω		24K790145		CLA-.47	.47 microhenries

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA			NOTES
	CURRENT	MOTOROLA PART No.	SYLVANIA PART No.	SELETRON PART No.	
M1	.300ADC	48B700139	NH-5	6QS1	
M2	.300ADC	48B700139	NH-5	6QS1	

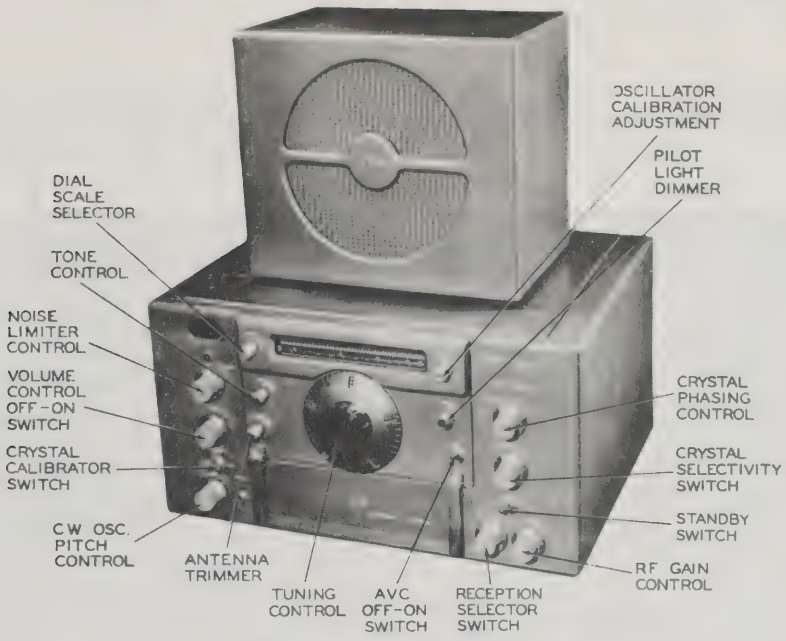
MISCELLANEOUS

ITEM No.	PART NAME	MOTOROLA PART No.	NOTES
M3	RF Tuner	1X700100	
M4A	Ion Trap	24K700587	
B	Ion Trap	24K700586	
C	Ion Trap	24K700585	
	Antenna	1X791900	Built-in loop complete model 14T1
	Antenna	1X791759	Built-in loop complete model 14K1
	Safety Glass	61C700134	
	Knob	36B790506	Channel selector
	Knob	36B790505	Contrast
	Knob	36C790507	Fine tuning, volume, models 14T1, 14K1
	Knob	36K791431	Fine tuning, volume, models 14T1B, 14K1B
	Knob	36A485457	Vert. hold, Horiz. hold, models 14T1, 14T1B
	Knob	36K790522	Vert. hold, Horiz. hold, models 14K1, 14K1B



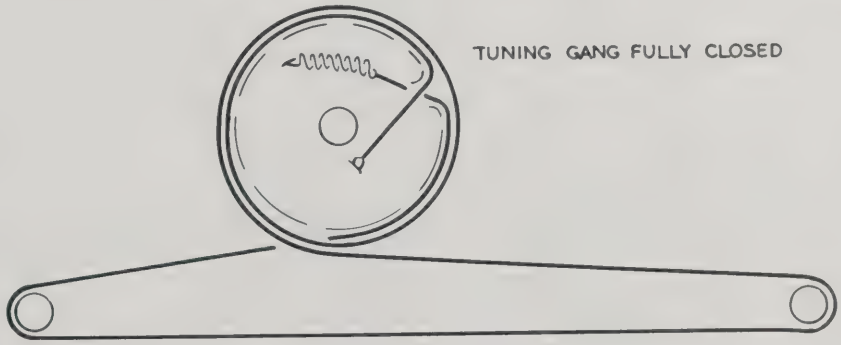
CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION

NATIONAL
MODEL HRO-50



NATIONAL MODEL HRO-50

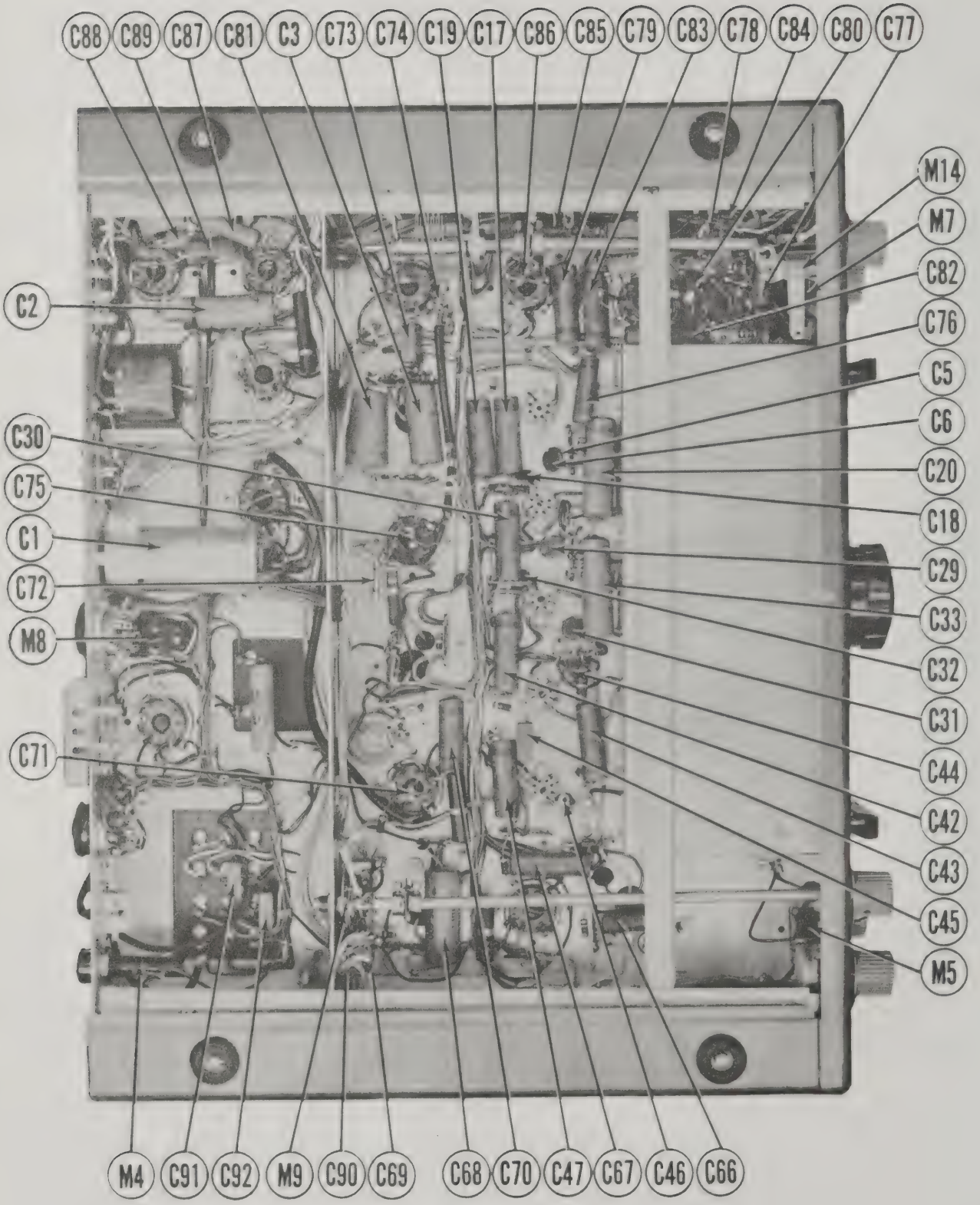
TRADE NAME	National, Model HRO-50 (Accesories-NFM-50, XCU 100/1000)
MANUFACTURER	National Co. Inc., Malden, Mass.
TYPE SET	AC Operated Multi-Band Communications Receiver (Accesories-Narrow Band FM Adaptor, Crystal Calibrator Unit)
TUBES(SEVENTEEN)	Types 6BA6 1st RF Amp., 6BA6 2nd RF Amp,, 6BE6 Mixer, 6C4 HF Osc., 6K7 1st IF Amp., 6K7 2nd IF Amp., 6J7 BFO, 6H6 DET-AVC, 6SN7GT S Meter Amp.-Phase Inv., 6H6 Noise Limiter, 6SJ7 Audio Amp., (2) 6V6GT Power Output, 0B2 Voltage Regulator, 5U4G Rectifier, 6AK6 Crystal Osc., 6SK7 FM IF Amp., 6H6 Ratio Det.
POWER SUPPLY	110-120 or 220-240 Volts AC
RATING	.95 Amp. at 117 Volts AC
TUNING RANGE	Band "A" 14-30MC, "B" 7-14.4MC, "C" 3.5-7.3MC, "D" 1.7-4MC, "E" 900-2050KC, "F" 480-960KC, "G" 180-430KC, "H" 100-200KC, "J" 50-100KC, "AA" 27.5-30MC, "AB" 25-35MC, "AC" 21-21.5MC



DIAL CORD DRIVE

NATIONAL
MODEL HRO-50

"The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed." "Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. Copyright 1950 by Howard W. Sams & Co., Inc., Indianapolis Indiana, U. S. of America. Copyright under International Copyright Union. All rights reserved under Inter-American Copyright Union (1910) by Howard W. Sams & Co., Inc." Printed in U. S. of America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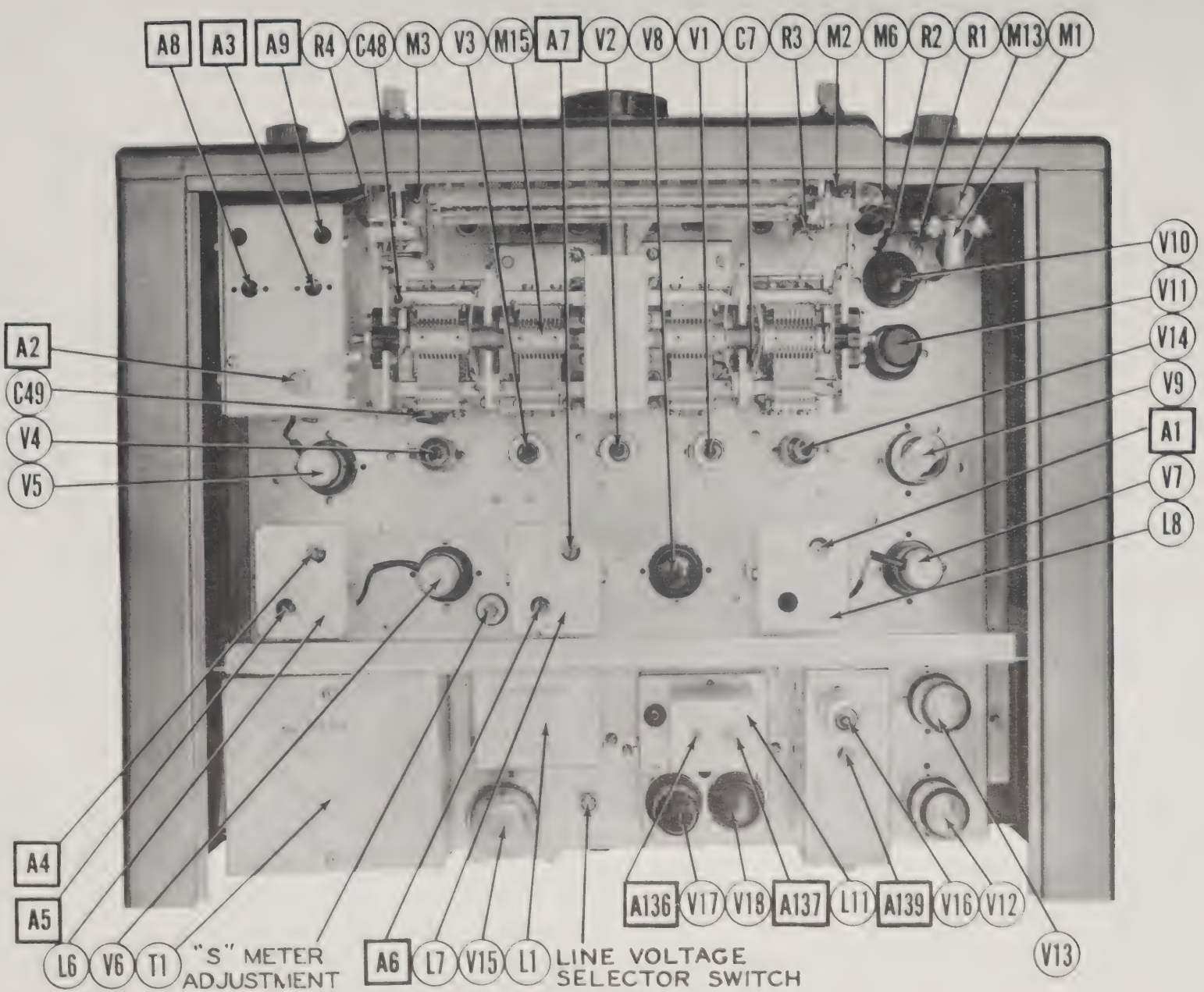
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R2
R1
M13
M1
V10
V11
V14
V9
A1
V7
L8
A2
C49
V4
V5
A4
A5
L6
V6
T1
"S" METER ADJUSTMENT
A6
L7
V15
L1
LINE VOLTAGE SELECTOR SWITCH
A136
V17
V18
A137
L11
A139
V16
V12
V13

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

To set the main tuning dial turn the tuning gang fully closed, loosen set screws and turn the dial slowly until the dial reads zero.

To set pointer, set the band selector until the band "D" scale appears and turn the main tuning dial to 490 and set pointer to 4MC reference mark on dial scale.

IF ALIGNMENT "CHECK" TO BE MADE PRIOR TO ALIGNMENT

(a) Set the AVC switch to "OFF", the control switch to "CW", the phasing control at zero, the selectivity switch at "5" and the RF gain control at 10.

(b) Vary the CWO control to point of lowest background noise and note the setting.

(c) Turn the selectivity switch to "OFF" position, and adjust "CWO" control to point of lowest background noise and note the setting.

(d) If IF Alignment is correct the two settings (b) and (c) should coincide and steps 1 thru 6 may be omitted.

IF ALIGNMENT

Controls should be set as follows except where noted otherwise: Set the control switch to "CW", the AVC switch to "OFF", the phasing control to zero, the selectivity switch to "5", the AF gain control to 10, and the RF gain control to 9.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	COIL SET	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	Direct	High side to pin 7 (Grid) of 6BE6 (V3). Low side to chassis.	455KC (Unmod.)	Any	Tuning gang fully open	Across voice coil		Adjust the "CWO" control for audio beat-note. If it is difficult to obtain the beat note, an adjustment of A1 will be required. Vary the signal generator between 453 and 457KC for a sharp peak response. Set the generator at this peak for IF Alignment.
2.	Direct	"	As set in step 1	"	"	"	A2, A3, A4, A5, A6, A7	Set the selectivity switch to "OFF", the control switch to "AM" position. Turn modulation of signal generator on. Adjust for maximum output.
3.	Direct	"	Two KC above frequency determined in step 1	"	"	"	A2,	Set the selectivity switch to "1" and adjust A2 for maximum output.
4.	Direct	"	Exact frequency determined in step 1	"	"	"	A8	Turn selectivity switch to "OFF" position. Adjust for maximum output.
5.	The phasing control is pre-set at the factory, and should not require adjustment, when correctly set a decrease in the background level will be noted with the selectivity switch at "5" and the phasing control at zero. If not, a slight adjustment of A9 will be required for proper setting.							
6.	Turn modulation of signal generator off and set control switch to "CW" position, Turn the "CWO" control fully clockwise and set knob to "5" on its scale. Adjust "CWO" control to zero beat with signal generator. If zero beat does not occur at "0" on the control dial a careful readjustment of A1 will be required.							

GENERAL COVERAGE ALIGNMENT

Set all controls as follows: Set the control switch to "AM", the AVC switch to "OFF", the selectivity switch to "OFF", the RF gain control to 10, the bandspread switch to the general coverage position.

The position of the antenna and oscillator trimmers should be with the arrows of these controls in a vertical position.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	COIL SET	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
7.	400Ω carbon res.	High side antenna terminal "A". Low side to chassis.	30MC (400 ∿ Mod.)	Band A	30MC	Across voice coil	A10 (pos. 8)	Adjust until signal is heard. Tune signal generator to 30.91 MC. If signal is not heard, retune generator to 30MC and open A10 to next peak. Adjust for maximum output and recheck for image.
8.	"	"	"	"	"	"	A11 (pos. 6) A12 (pos. 4)	Adjust for maximum output.
9.	"	"	14.4MC	"	Tune for max. output	"	A13 (pos. 16) A14 (pos. 13) A15 (pos. 11) A16 (pos. 9)	Adjust A13 until signal is heard. Adjust A14, A15 and A16 for maximum output. Repeat steps 7, 8, and 9 until no further improvement can be made.
10.	400Ω carbon res.	High side antenna terminal "A". Low side to chassis.	14.4MC	Band B	14.4MC	Across voice coil	A17 (pos. 8)	Adjust until signal is heard. Tune signal generator to 15.31 MC. If no signal is heard, retune generator to 14.4MC and open A17 to next peak. Adjust for maximum output and recheck for image.
11.	"	"	14.4MC	"	14.4MC	"	A18 (pos. 6) A19 (pos. 4) A20 (pos. 2)	Adjust for maximum output.
12.	"	"	7MC	"	Tune for max. output	"	A21 (pos. 16) A22 (pos. 13) A23 (pos. 11) A24 (pos. 9)	Adjust A21 until signal is heard. Adjust A22, A23 and A24 for maximum output. Repeat steps 10, 11 and 12 until no further improvement can be made.
13.	"	"	7.3MC	Band C	7.3MC	"	A25 (pos. 8)	Adjust until signal is heard. Tune signal generator to 8.21MC If signal is not heard retune generator to 7.3MC and open A25 to next peak and adjust for maximum output and recheck for image.
14.	"	"	"	"	"	"	A26 (pos. 6) A27 (pos. 4) A28 (pos. 2)	Adjust for maximum output.
15.	"	"	3.5MC	"	Tune for max. output	"	A29 (pos. 16) A30 (pos. 13) A31 (pos. 11) A32 (pos. 9)	Adjust A29 until signal is heard. Adjust A30, A31 and A32 for maximum output. Repeat steps 13, 14 and 15 until no further improvement can be made.
16.	"	"	4MC	Band D	4MC	"	A33 (pos. 8)	Adjust until signal is heard. Tune signal generator to 4.91 MC. If no signal is heard, retune generator to 4MC and open A33 to next peak. Adjust for maximum output and recheck for image.
17.	"	"	"	"	"	"	A34 (pos. 6) A35 (pos. 4)	Adjust for maximum output.
18.	"	"	1.8MC	"	Tune for max. output	"	A36 (pos. 16) A37 (pos. 13) A38 (pos. 11) A39 (pos. 9)	Adjust A36 until signal is heard. Adjust A37, A38 and A39 for maximum output. Repeat steps 16, 17 and 18 until no further improvement can be made.
19.	"	"	2MC	Band E	2MC	"	A40 (pos. 8)	Adjust until signal is heard. Tune signal generator to 2.91 MC. If signal is not heard, retune generator to 2MC and open A40 to next peak. Adjust for maximum output and recheck for image.

ALIGNMENT INSTRUCTIONS (CONT.)

20.	400Ω carbon res.	High side antenna terminals "A". Low side to chassis.	2MC	Band E	2MC	Across voice coil	A41 (pos. 6) A42 (pos. 4)	Adjust for maximum output.
21.	"	"	1MC	"	Tune for max. output	"	A43 (pos. 7)	Adjust until signal is heard.
22.	"	"	1.4MC	"	"	"	A44 (pos. 16)	Adjust until signal is heard. Repeat steps 19 thru 22 until no further improvement can be made.
23.	"	"	900KC	Band F	900KC	"	A45 (pos. 8)	Adjust until signal is heard. Tune signal generator to 1.81MC. If signal is not heard, retune generator to 900KC and open A45 to next peak. Adjust for maximum output and recheck for image.
24.	"	"	"	"	"	"	A46 (pos. 6) A47 (pos. 4) A48 (pos. 2)	Adjust for maximum output.
25.	"	"	500KC	"	500KC	"	A49 (pos. 7)	Adjust until signal is heard.
26.	"	"	700KC	"	700KC	"	A50 (pos. 16)	Adjust until signal is heard. Repeat steps 23, 24, 25 and 26 until no further improvement can be made.
27.	"	"	400KC	Band G	400KC	"	A51 (pos. 8)	Adjust until signal is heard. Tune signal generator to 1310 KC. If signal is not heard, retune generator to 400KC and open A51 to next peak. Adjust for maximum output and recheck for image.
28.	"	"	"	"	"	"	A52 (pos. 6) A53 (pos. 4)	Adjust for maximum output.
29.	"	"	200KC	"	200KC	"	A54 (pos. 7)	Adjust until signal is heard.
30.	"	"	300KC	"	300KC	"	A55 (pos. 16)	Adjust until signal is heard. Repeat steps 27, 28, 29 and 30 until no further improvement can be made.
31.	"	"	200KC	Band H	200KC	"	A56 (pos. 8)	Adjust until signal is heard. Tune signal generator to 1110KC. If signal is not heard, retune generator to 200KC and open A56 to next peak. Adjust for maximum output and recheck for image.
32.	"	"	"	"	" "	"	A57 (pos. 6) A58 (pos. 4) A59 (pos. 2)	Adjust for maximum output.
33.	"	"	100KC	"	100KC	"	A60 (pos. 7)	Adjust until signal is heard.
34.	"	"	150KC	"	150KC	"	A61 (pos. 16)	Adjust until signal is heard. Repeat steps 31, 32, 33 and 34 until no further improvement can be made.

35.	400Ω carbon res.	High side antenna terminals "A". Low side to chassis.	100KC	Band J	100KC	Across voice coil	A62 (pos. 8)	Adjust until signal is heard. Tune signal generator to 1010KC. If signal is not heard, retune generator to 100KC and open A62 to next peak. Adjust for maximum output and recheck for image.
36.	"	"	"	"	"	"	A63 (pos. 6) A64 (pos. 4) A65 (pos. 2)	Adjust for maximum output.
37.	"	"	50KC	"	50KC	"	A66 (pos. 7)	Adjust until signal is heard.
38.	"	"	75KC	"	75KC	"	A67 (pos. 16)	Adjust until signal is heard. Repeat steps 35, 36, 37 and 38 until no further improvement can be made.
39.	"	"	30MC	Band AA	30MC	"	A68 (pos. 7)	Adjust until signal is heard. Tune signal generator to 30.91 MC. If no signal is heard, retune generator to 30MC and open A68 to next peak. Adjust for maximum output and recheck for image.
40.	"	"	"	"	"	"	A69 (pos. 5) A70 (pos. 3) A71 (pos. 1)	Adjust for maximum output.
41.	"	"	27.2MC	"	Tune for max. output	"	A72 (pos. 8) A73 (pos. 6) A74 (pos. 4) A75 (pos. 2)	Adjust A72 until signal is heard. Adjust A73, A74 and A75 for maximum output.
42.	"	"	28MC	"	"	"	A76 (pos. 16) A77 (pos. 13) A78 (pos. 11) A79 (pos. 9)	Adjust A76 until signal is heard. Adjust A77, A78 and A79 for maximum output. Repeat steps 39, 40, 41 and 42 until no further improvement can be made.
43.	"	"	35MC	Band AB	35MC	"	A80 (pos. 8)	Adjust until signal is heard. Tune signal generator to 35.91 MC. If signal is not heard, retune generator to 35MC and open A80 to next peak. Adjust for maximum output and recheck for image.
44.	"	"	"	"	"	"	A81 (pos. 6) A82 (pos. 4) A83 (pos. 2)	Adjust for maximum output.
45.	"	"	25MC	"	Tune for max. output	"	A84 (pos. 7) A85 (pos. 5) A86 (pos. 3) A87 (pos. 1)	Adjust A84 until signal is heard. Adjust A85, A86 and A87 for maximum output.

SET 112

FOLDER 7

NATIONAL
MODEL HRO-50

ALIGNMENT INSTRUCTIONS (CONT.)

46.	400Ω carbon res.	High side antenna terminals "A". Low side to chassis.	30MC	Band AB	Tune for max. output	Across voice coil	A88 (pos.16) A89 (pos.13) A90 (pos.11) A91 (pos.9)	Adjust A88 until signal is heard. Adjust A89 , A90 and A91 for maximum output. Repeat steps 43, 44, 45 and 46 until no further improvement can be made.
47.	"	"	21.5MC	Band AC	21.5MC	"	A92 (pos.7)	Adjust until signal is heard. Tune signal generator to 22.41 MC. If signal is not heard, retune generator to 21.5MC and open A92 to next peak. Adjust for maximum output and recheck for image.
48.	"	"	"	"	"	"	A93 (pos.5) A94 (pos.3) A95 (pos.1)	Adjust for maximum output.
49.	"	"	21MC	"	Tune for max. output	"	A96 (pos.8) A97 (pos.6) A98 (pos.4) A99 (pos.2)	Adjust A96 until signal is heard. Adjust A97, A98 and A99 for maximum output.
50.	"	"	21.3MC	"	"	"	A100 (pos.16) A101 (pos.13) A102 (pos.11) A103 (pos.9)	Adjust A100 until signal is heard. Adjust A101, A102 and A103 for maximum output. Repeat steps 47, 48, 49 and 50 until no further improvement can be made.

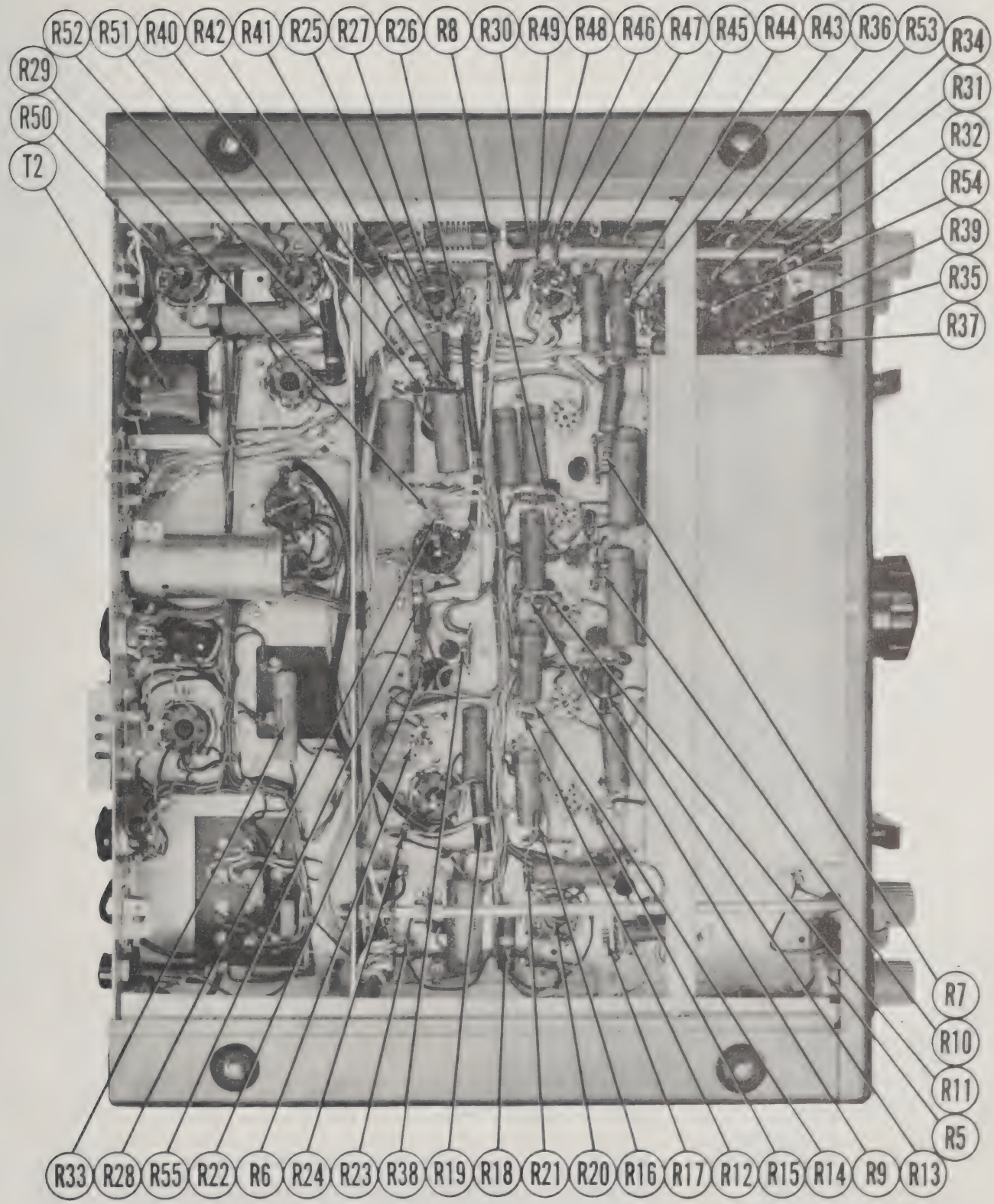
BANDSPREAD ALIGNMENT

Set the bandspread switch to the bandspread position. All other controls remain the same as in GENERAL COVERAGE ALIGNMENT.

General coverage alignment should be completed before bandspread alignment.

Tracking of the RF stages at low frequency end of each band may be checked as follows: After adjustments of padders is completed, attempt to peak each stage with its associated high frequency trimmer. Any change in capacity should cause a decrease in output if that stage is tracking correctly. This checking procedure will misalign the high frequency trimmers, therefore, they should be repeaked at the high frequency end of the band per alignment instructions.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	COIL SET	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
51.	400Ω carbon res.	High side to antenna terminal "A". Low side to chassis.	30MC (400 ∿ Mod.)	Band A	30MC	Across voice coil	A104 (pos.7)	Adjust until signal is heard. Tune signal generator to 30.91 MC. If signal is not heard, retune generator to 30MC and open A104 to next peak. Adjust for maximum output and recheck for image.
52.	"	"	"	"	"	"	A105 (pos.5) A106 (pos.3) A107 (pos.1)	Adjust for maximum output.
53.	"	"	27.2MC	"	Tune for max. output	"	A108 (pos.15) A109 (pos.14) A110 (pos.12) A111 (pos.10)	Adjust A108 until signal is heard. Adjust A109, A110 and A-111 for maximum output. Repeat steps 51, 52 and 53 until no further improvement can be made.
54.	400Ω carbon res.	High side to antenna terminal "A". Low side to chassis.	14.4MC	Band B	14.4MC	Across voice coil	A112 (pos.7)	Adjust until signal is heard. Tune signal generator to 15.31 MC. If signal is not heard, retune generator to 14.4MC and open A112 to next peak. Adjust for maximum output and recheck for image.
55.	"	"	"	"	"	"	A113 (pos.5) A114 (pos.3) A115 (pos.1)	Adjust for maximum output.
56.	"	"	14MC	"	Tune for max. output	"	A116 (pos.15) A117 (pos.14) A118 (pos.12) A119 (pos.10)	Adjust A116 until signal is heard. Adjust A117, A118 and A119 for maximum output. Repeat steps 54, 55 and 56 until no further improvement can be made.
57.	"	"	7.3MC	Band C	7.3MC	"	A120 (pos.7)	Adjust until signal is heard. Tune signal to 8.21MC. If signal is not heard, retune generator to 7.3MC and open A120 to next peak. Adjust for maximum output and recheck for image.
58.	"	"	"	"	"	"	A121 (pos.5) A122 (pos.3) A123 (pos.1)	Adjust for maximum output.
59.	"	"	7MC	"	Tune for max. output	"	A124 (pos.15) A125 (pos.14) A126 (pos.12) A127 (pos.10)	Adjust A124 until signal is heard. Adjust A125, A126 and A127 for maximum output. Repeat steps 57, 58 and 59 until no further improvement can be made.
60.	"	"	4MC	Band D	4MC	"	A128 (pos.7)	Adjust until signal is heard. Tune signal generator to 4.91 MC. If signal is not heard, retune generator to 4MC and open A128 to next peak. Adjust for maximum output and recheck for image.
61.	"	"	"	"	"	"	A129 (pos.5) A130 (pos.3) A131 (pos.1)	Adjust for maximum output.
62.	"	"	3.5MC	"	Tune for max. output	"	A132 (pos.15) A133 (pos.14) A134 (pos.12) A135 (pos.10)	Adjust A132 until signal is heard. Adjust A133, A134 and A135 for maximum output. Repeat steps 60, 61 and 62 until no further improvement can be made.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R9
R13

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: NATIONAL PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	NOTES
V1	1st RF Amp.	6BA6	6BA6	7BK	
V2	2nd RF Amp.	6BA6	6BA6	7BK	
V3	Mixer	6BE6	6BE6	7CH	
V4	HF Oscillator	6C4	6C4	6BG	
V5	1st IF Amp.	6K7	6K7	7R	
V6	2nd IF Amp.	6K7	6K7	7R	
V7	BF Oscillator	6J7	6J7	7R	
V8	Det. -AVC	6H6	6H6	7Q	
V9	"S" Meter Amp. - Phase Inv.	6SN7GT	6SN7GT	8BD	
V10	Noise Limiter	6H6	6H6	7Q	
V11	Audio Amp.	6SJ7	6SJ7	8N	
V12	Power Output	6V6GT	6V6GT	7AC	
V13	Power Output	6V6GT	6V6GT	7AC	
V14	Voltage Regulator	0B2	0B2	5BO	
V15	Rectifier	5U4G	5U4G	5T	
V16	Crystal Osc.	6AK6	6AK6	7BK	XCU (100/1000KC Crystal Calibrator unit)
V17	FM IF Amp.	6SK7	6SK7	8N	NFM-50 (Narrow Band FM adaptor)
V18	Ratio Det.	6H6	6H6	7Q	NFM-50 (Narrow Band FM adaptor)

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: NATIONAL PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	40	475	K945-3	AF88K		UP4450		TVL-2830	▲ Filter
B	40	475							▲ Filter
C2	25	50	E338-4	PRS50/25		BR255A		TVA-1306	Output Cath. Bypass
C3	25	50	E338-4	PRS50/25		BR255A			Tone Comp.
C4	1	450	E338-10	PRS450/4		BR145		TVA-1300	Stabilizing Cap.
C5	5000		K946-1	BPD-005	DD-502	1D5D5	811-005	29C1	AVC Filter
C6	5000		K946-1	BPD-005	DD-502	1D5D5	811-005	29C1	AVC Filter
C7	10000	300	J666-56	1467-01	D6-103	1D3S1	811-01	1FM-11	AVC Filter
C8	12		D825D-404						Fixed Padder
C9	5		D825D-401						Fixed Padder
C10	12		D825D-404						Fixed Padder
C11	25.7		D825D-412						Fixed Padder
C12	5		D825D-401						Fixed Trimmer
C13	10		D825D-402						Fixed Trimmer
C14	50		D825D-417						Fixed Trimmer
C15	1200	500	J666-16						Fixed Padder
C16	120		D825C-305						Fixed Padder
C17	.1	400	D927-11	P488-1	DF-104	PTE4P1		4TM-P1	1st RF Cathode
C18	5000		K946-1	BPD-005	DD-502	1D5D5	811-005	29C1	Decoupling
C19	.1	400	D827-11	P488-1	DF-104	PTE4P1		4TM-P1	Decoupling
C20	.1	600	D827-13	P688-1	DF-104	PTE6P1		6TM-P1	Decoupling
C21	21		D825D-410						Fixed Padder
C22	5		D825D-401						Fixed Padder
C23	12		D825D-404						Fixed Padder
C24	27.5		D825D-412						Fixed Padder
C25	21		D825D-410						Fixed Trimmer
C26	470	500	J665-56						RF Coupling
C27	100		D825C-304						Fixed Padder
C28	68		D825D-439						Fixed Trimmer
C29	5000		K946-1	BPD-005	DD-502	1D5D5	811-005	29C1	AVC Filter
C30	.1	400	D827-11	P488-1	DF-104	PTE4P1		4TM-P1	2nd RF Cath.
C31	5000		K946-1	BPD-005	DD-502	1D5D5	811-005	29C1	2nd RF Cath.
C32	5000		K946-1	BPD-005	DD-502	1D5D5	811-005	29C1	Decoupling
C33	.1	600	D827-13	P688-1	DF-104	PTE6P1		6TM-P1	Decoupling
C34	21		D825D-410						Fixed Padder
C35	5		D825D-401						Fixed Padder
C36	12		D825D-404						Fixed Padder
C37	27.5		D825D-412						Fixed Padder
C38	5		D825D-401						Fixed Padder
C39	100		D825C-304						Fixed Padder
C40	470	500	J665-56						RF Coupling
C41	68		D825D-439						Fixed Padder

PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: NATIONAL PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	INSTALLATION NOTES
R1	500KΩ	½	J681-2				Limiter control and switch
R2A	500KΩ	½	K347-1	Q13-133	AM-60-Z	B-60-S	AF Gain control
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Attach to R2A per instructions
C	Switch		Not Req.	76-1	SWA	Not Req.	Attach to R2A per instructions
R3A	500KΩ	½	K347-1	Q13-133	AM-60-Z	B-60-S	Tone control
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Attach to R3A per instructions
C	Switch		Not Req.	76-1	SWA	Not Req.	Attach to R3A per instructions
R4	25Ω	2	K915-13	W-25	43-25	V-111	Dimmer control-Wire Wound
R5	10KΩ	2	K349-3				RF gain control-Wire Wound
R6	1000Ω	1	D831-2	WK-1000	43-1000	VK-129	"S" meter adjustment-Wire Wound

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: NATIONAL PART No.	IRC PART No.	IDENTIFICATION CODES
R7	470KΩ	½	J569-57	BTS-470K	AVC Network
R8	100Ω	½	J569-13	BTS-100	1st RF Amp. Cathode
R9	2200Ω	½	J569-29	BTS-2200	RF Screen Dropping
R10	470KΩ	½	J569-57	BTS-470K	AVC Network
R11	560Ω	½	J569-22	BTS-560	2nd RF Amp. Cathode
R12	22KΩ	½	J569-41	BTS-22K	Mixer Grid
R13	33KΩ	1	J571-43	BTA-33K	Mixer Screen
R14	220Ω	½	J569-17	BTS-220	Mixer Cathode
R15	22KΩ	½	J569-41	BTS-22K	Osc. Grid
R16	22Ω	½	J569-5		Parasitic Suppressor
R17	470KΩ	½	J569-57	BTS-470K	AVC Network
R18	27KΩ	2	J572-42	BTB-27K	Voltage Divider
R19	15KΩ	2	J572-39	BTB-15K	Screen Dropping
R20	220Ω	½	J569-17	BTS-220	1st IF Amp. Cathode
R21	330Ω	½	J569-19	BTS-330	1st IF Amp. Cathode
R22	2200Ω	½	J569-29	BTS-2200	Plate Decoupling
R23	470KΩ	½	J569-57	BTS-470K	AVC Network
R24	220Ω	½	J569-17	BTS-220	2nd IF Amp. Cathode-See Note 1
R25	100KΩ	½	J569-49	BTS-100K	Voltage Divider
R26	100KΩ	½	J569-49	BTS-100K	BFO Screen
R27	220KΩ	½	J569-53	BTS-220K	BFO Plate
R28	1.5 Meg.	½	J569-63	BTS-1.5 Meg.	AVC Diode Load
R29	1.5 Meg.	½	J569-63	BTS-1.5 Meg.	AVC Network
R30	47KΩ	½	J569-45	BTS-47K	"S" Meter Amp. Plate
R31	22KΩ	½	J569-41	BTS-22K	Diode Filter
R32	470KΩ	½	J569-57	BTS-470K	Det. Diode Load
R33	5000Ω	10	E959-10	1 3/4A-5000	Decoupling-Wire Wound
R34	220KΩ	½	J569-53	BTS-220K	Noise Limiter Plate
R35	220KΩ	½	J569-53	BTS-220K	Voltage Divider
R36	220KΩ	½	J569-53	BTS-220K	Noise Limiter Cathode
R37	470KΩ	½	J569-57	BTS-470K	Noise Limiter Plate
R38	820KΩ	½	J569-60	BTS-820K	Decoupling
R39	220KΩ	½	J569-53	BTS-220K	Voltage Divider
R40	2200Ω	½	J569-29	BTS-2200	Audio Amp. Cathode
R41	150Ω	½	J569-15	BTS-150	Audio Amp. Cathode
R42	6800Ω	½	J569-35	BTS-6800	Feedback
R43	100KΩ	½	J569-49	BTS-100K	Audio Amp. Screen
R44	100KΩ	½	J569-49	BTS-100K	Audio Amp. Plate
R45	47KΩ	½	J569-45	BTS-47K	Audio Amp. Decoupling
R46	220KΩ	½	J569-53	BTS-220K	Phase Inv. Grid
R47	4700Ω	½	J569-33	BTS-4700	Phase Inv. Cathode
R48	47KΩ	½	J569-45	BTS-47K	Phase Inv. Cathode
R49	47KΩ	½	J569-45	BTS-47K	Phase Inv. Plate
R50	220KΩ	½	J569-53	BTS-220K	Audio Output Grid
R51	220KΩ	½	J569-53	BTS-220K	Audio Output Grid
R52	220Ω	2	J572-17	BW-2-220	Audio Output Cathode-Wire Wound
R53	470Ω	2	J572-21	BTB-470	Voice Coil Shunt
R54	4.3Ω	1	K098-34		Noise Limiter Filament-Wire Wound
R55	4.3Ω	1	K098-34		Det. Filament-Wire Wound
R56	4.7 Meg.	½	J569-69	BTS-4.7 Meg.	Osc. Grid
R57	150Ω	½	J569-15		Parasitic Suppressor-See Note 2
R58	22KΩ	1	J571-41	BTA-22K	Osc. Screen-See Note 3
R59	470KΩ	1	J571-57	BTA-470K	Osc. Plate
R60	1 Meg.	½	K379-61	BTS-1 Meg.	FM IF Amp. Grid
R61	1000Ω	½	K379-25	BTS-1000	FM IF Amp. Cathode

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA NATIONAL PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C42	.1	400	D827-11	P488-1	DF-104	PTE4P1		4TM-P1	Mixer Cath. Byp.
C43	.1	400	D827-11	P488-1	DF-104	PTE4P1		4TM-P1	Mixer Screen Byp.
C44	5000		K946-1	BPD-005	DD-502	1D5D5	811-005	29C1	Decoupling *
C45	10000	300	J666-56	1467-01	D6-103	1D3S1	811-01	1FM-11	Osc. Coupling
C46	100		D825D-421	SI100	D6-101	5W5T1	GP1K-100	19C11	Osc. Grid Cap.
C47	.1	400	D827-11	P488-1	DF-104	PTE4P1		4TM-P1	Decoupling
C48	10		D825D-437	SI10N750	TCN-10		N750K-10	19C4	Fixed Padder
C49	5		H872-3						Fixed Padder
C50	10		D825D-402						Fixed Padder
C51	1200	300	J666-63						Fixed Padder
C52	10		D825D-437						Fixed Trimmer
C53	2600	500	J666-61						Fixed Padder
C54	10		D825D-437						Fixed Trimmer
C55	1600	500	J666-21						Fixed Padder
C56	900	500	J666-62						Fixed Padder
C57	21		D825D-410						Fixed Padder
C58	470	500	H500-18						Fixed Padder
C59	350		D825C-331						Fixed Padder
C60	100		D825C-304						Fixed Padder
C61	50		D825D-417						Fixed Padder
C62	68		D825D-439						Fixed Trimmer
C63	68		D825D-439						Fixed Trimmer
C64	100		D825C-304						Fixed Padder
C65	68		D825D-439						Fixed Trimmer
C66	.01	600	D827-7	P688-01	D6-103	PTE6S1	811-01	6TM-S1	AVC Filter
C67	.1	400	D827-11	P488-1	DF-104	PTE4P1		4TM-P1	1st IF Cath.
C68	.25	600	D827-19	684-25		GT6P25		6TM-P25	Decoupling
C69	.01	600	D827-7	P688-01	D6-103	PTE6S1	811-01	6TM-S1	AVC Filter
C70	.1	400	D827-11	P488-1	DF-104	PTE4P1		4TM-P1	Decoupling
C71	10		D825D-402	SI10NPO	TCZ-10	5R5Q1	NPOK-10	19C3	IF Coupling
C72	270		J633-2	SI270	D6-271	5W5T25	GP2K-270	19C31	Diode RF Filter
C73	10000	300	J666-56	1467-01	D6-103	1D3S1	811-01	1FM-11	BFO Screen
C74	3		J695-4	SI3NPO	TCZ-3.3		NPOK-3		BFO Coupling
C75	100		D825D-421	SI100	D6-101	5W5T1	GP1K-100	19C11	IF Coupling
C76	.01	600	D825-7	P688-01	D6-103	PTE6S1	811-01	6TM-S1	AVC Filter
C77	.01	600	D827-7	P688-01	D6-103	PTE6S1	811-01	6TM-S1	Audio Coupling
C78	.1	400	D827-11	P488-1	DF-104	PTE4P1		4TM-P1	Noise Filter
C79	.1	400	D827-11	P488-1	DF-104	PTE4P1		4TM-P1	Noise Filter
C80	.01	600	D827-7	P688-01	D6-103	PTE6S1	811-01	6TM-S1	Audio Coupling
C81	.5	100	D827-49	P288-5		GT2P5		2TM-P5	AF Amp. Cath.
C82	.1	400	D827-11	P488-1	DF-104	PTE4P1		4TM-P1	AF Amp. Screen
C83	.1	400	D827-11	P488-1	DF-104	PTE4P1		4TM-P1	AF Amp. Dec.
C84	.01	600	D827-7	P688-01	D6-103	PTE6S1	811-01	6TM-S1	Tone Comp.
C85	.01	600	D827-7	P688-01	D6-103	PTE6S1	811-01	6TM-S1	Audio Coupling
C86	100		D825D-421	SI100	D6-101	5W5T1	GP1K-100	19C11	Phase Inv. Grid
C87	.01	600	D827-7	P688-01	D6-103	PTE6S1	811-01	6TM-S1	Audio Coupling
C88	.01	600	D827-7	P688-01	D6-103	PTE6S1	811-01	6TM-S1	Audio Coupling
C89	2400	1000	J667-68	1464-HV-0025					Output Plate Byp.
C90	.01	600	D827-01	P688-01	D6-103	PTE6S1	811-01	6TM-S1	RF Bypass
C91	10000	300	J666-56	1467-01	D6-103	1D3S1	811-01	1FM-11	Line Filter
C92	10000	300	J666-56	1467-01	D6-103	1D3S1	811-01	1FM-11	Line Filter
C93	10		D825D-402	SI10	D6-100	5W5Q1	GP1K-10	19C19	IF Coupling
C94	38		D825D-414		TCZ-39		NPOL-39		Voltage Divider
C95	10000	300	J666-56	1467-01	D6-103	1D3S1	811-01	1FM-11	FM IF Cathode
C96	1000	500	J665-71	1468-0005	D6-102	1W5D1	GP2L-001	1FM-21	FM IF Screen
C97	10000	300	J666-56	1467-01	D6-103	1D3S1	811-01	1FM-11	FM IF Decoupling
C98	470	500	J665-56	1468-0005	D6-471	5W5T5	GP2K-470	1FM-35	Diode Load Cap.
C99	10000	300	J666-56	1467-01	D6-103	1D3S1	811-01	1FM-11	Audio Coupling
C100	.1	400	D827-11	P488-1	DF-104	PTE4P1		4TM-P1	Osc. Screen Dec.
C101	.1	400	D827-11	P488-1	DF-104	PTE4P1		4TM-P1	Osc. Screen Dec.
C102	10		H822-1	SI10	D6-100	5W5Q1	GP1K-10	19C19	Osc. Coupling
C103	3		J695-4	SI3NPO	TCZ-3.3		NPOK-3		Osc. Feedback *

* Not used in all models.

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA NATIONAL PART No.	IRC PART No.	IDENTIFICATION CODES
R62	47KΩ	1/2	K379-45	BTS-47K	FM IF Amp. Screen
R63	4700Ω	1/2	J569-33	BTS-4700	FM IF Amp. Decoupling
R64	15KΩ	1/2	K379-39	BTS-15K	Ratio Det. Diode Load
R65	15KΩ	1/2	K379-39	BTS-15K	Ratio Det. Diode Load
R66	47KΩ	1/2	K379-45	BTS-47K	De-emphasis

Note 1. Some models use a 330Ω resistor in this application.
Note 2. Not used in all models.
Note 3. Some models use a 2200Ω, 1 watt resistor in this application.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	RATING SEC. 3	REPLACEMENT DATA NATIONAL PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.
T1	117VAC @ .95A	540VCT .140ADC	5VAC @ 2A	6.3VAC @ 5.2A	P188-1	P-2059 ① ②		

① Drill new mounting holes.
② Add series resistor to reduce plate voltage.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING IMPEDANCE PRI.	RATING IMPEDANCE SEC.	RATING DC RES. PRI.	RATING DC RES. SEC.	REPLACEMENT DATA NATIONAL PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	INSTALLATION NOTES
T2	6000Ω CT	500Ω Tap @ 8Ω	300Ω CT	20Ω Tap @ .8Ω	P187-1				

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA NATIONAL PART No.	JENSEN PART No.	QUAM PART No	INSTALLATION NOTES
SP1	FIELD / PM	V. C. IMP. 6.5Ω	P297-1	ST-120 MOD. P10-S	8A-4	
SP2	CONE DIA. 9 3/8"	V. C. DIA. 3/4"				

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D. C. RESISTANCE	RATINGS INDUCTANCE (0 CURRENT 1000 ~)	REPLACEMENT DATA NATIONAL PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	INSTALLATION NOTES
L1	.140ADC	290Ω	1 Henry	SA:1694			R-23110 ①	① Drill new mounting holes.

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA NATIONAL PART No.	MEISSNER PART No.	NOTES
L2A	Ant. Trans.	.2Ω	.1Ω	SA:6808		50-100KC J Band
B	Ant. Trans.			SA:6803		100-200KC H Band
C	Ant. Trans.			SA:6665		180-430KC G Band
D	Ant. Trans.			SA:6660		480-960KC F Band
E	Ant. Trans.			SA:6513		900-2050KC E Band
F	Ant. Trans.			SA:6635		1.7-4MC D Band
G	Ant. Trans.			SA:6759		3.5-7.3MC C Band
H	Ant. Trans.			SA:6755		7-14.4MC B Band
I	Ant. Trans.			SA:6654		14-30MC A Band
J	Ant. Trans.			SA:8073		21-21.5MC AC Band
K	Ant. Trans.			SA:6675		25-35MC AB Band
L	Ant. Trans.			SA:6814		27-30MC AA Band

SET 112
FOLDER 7
NATIONAL
MODEL HRO-50

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

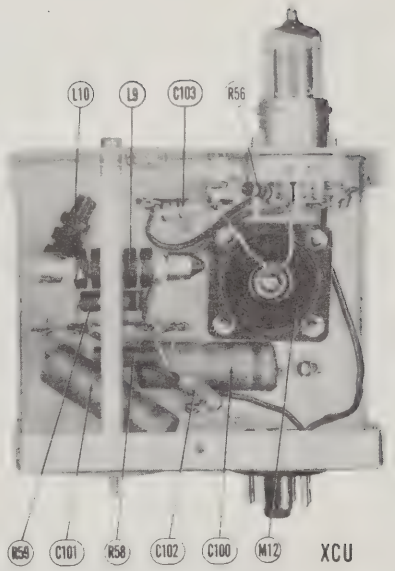
ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA NATIONAL PART No.	REPLACEMENT DATA MEISSNER PART No.	NOTES
L3A	1st RF Trans.	.1Ω	.1Ω	SA:6809		50-100KC J Band
B	1st RF Trans.			SA:6669		100-200KC H Band
C	1st RF Trans.			SA:6667		180-430KC G Band
D	1st RF Trans.			SA:6662		480-960KC F Band
E	1st RF Trans.			SA:6540		900-2050KC E Band
F	1st RF Trans.			SA:6637		1.7-4MC D Band
G	1st RF Trans.			SA:6641		3.5-7.3MC C Band
H	1st RF Trans.			SA:6650		7-14.4MC B Band
I	1st RF Trans.			SA:6751		14-30MC A Band
J	1st RF Trans.			SA:8074		21-21.5MC AC Band
K	1st RF Trans.			SA:6818		25-35MC AB Band
L	1st RF Trans.			SA:6673		27-30MC AA Band
L4A	2nd RF Trans.	.2Ω	.1Ω	SA:6810		50-100KC J Band
B	2nd RF Trans.			SA:6804		100-200KC H Band
C	2nd RF Trans.			SA:6800		180-430KC G Band
D	2nd RF Trans.			SA:6794		480-960KC F Band
E	2nd RF Trans.			SA:6789		900-2050KC E Band
F	2nd RF Trans.			SA:6638		1.7-4MC D Band
G	2nd RF Trans.			SA:6642		3.5-7.3MC C Band
H	2nd RF Trans.			SA:6756		7-14.4MC B Band
I	2nd RF Trans.			SA:6752		14-30MC A Band
J	2nd RF Trans.			SA:8075		21-21.5MC AC Band
K	2nd RF Trans.			SA:6676		25-35MC AB Band
L	2nd RF Trans.			SA:6815		27-30MC AA Band
L5A	HF Osc.	.1Ω		SA:6811		50-100KC J Band
B	HF Osc.			SA:6805		100-200KC H Band
C	HF Osc.			SA:6785		180-430KC G Band
D	HF Osc.			SA:6795		480-960KC F Band
E	HF Osc.			SA:6631		900-2050KC E Band
F	HF Osc.			SA:6776		1.7-4MC D Band
G	HF Osc.			SA:6760		3.5-7.3MC C Band
H	HF Osc.			SA:6678		7-14.4MC B Band
I	HF Osc.			SA:6656		14-30MC A Band
J	HF Osc.			SA:8076		21-21.5MC AC Band
K	HF Osc.			SA:6819		25-35MC AB Band
L	HF Osc.			SA:6816		27-30MC AA Band
L6	1st IF	8.4Ω	8.4Ω	SA:2492		
L7	2nd IF	8.4Ω	8.4Ω	SA:41G		
L8	BFO Coil	47KΩ		SA:3361		Includes trimmer, 2 capacitors and resistor.
L9	100KC Inductor	95Ω		SA:4373		5 microhenries
L10	1000KC Inductor	17Ω		SA:2514		.5 microhenries
L11	Ratio Det. Trans.	8Ω	9Ω	SA:4890		

DIAL LIGHTS

ITEM No.	BASE TYPE	VOLTS	AMPS.	BEAD COLOR	REPLACEMENT DATA NATIONAL PART No.	REPLACEMENT DATA	NOTES
M1	Bayonet	6-8	.15	Brown	F136-6		Type #47
M2	Bayonet	6-8	.15	Brown	F136-6		Type #47
M3	Bayonet	6-8	.15	Brown	F136-6		Type #47

MISCELLANEOUS

ITEM No.	PART NAME	NATIONAL PART No.	NOTES
M4	Fuse	F135-4	3AG 2 Amp. at 250V
M5	Switch	E230-2	B+ On-Off
M6	Switch	E230-2	AVC
M7	Switch	P738-1	Calibrate
M8	Switch	H340-4	110-120/220-240
M9	Switch	SA:6546	Function
M10	Switch	E195-3	Selectivity
M11	Crystal Filter	SA:3654	455KC
M12	Crystal	E979-1	
M13	Meter	J984-5	Carrier Level
M14	Phone Jack	F316-1	
M15	Tuning Gang	SA:6592	Four Section



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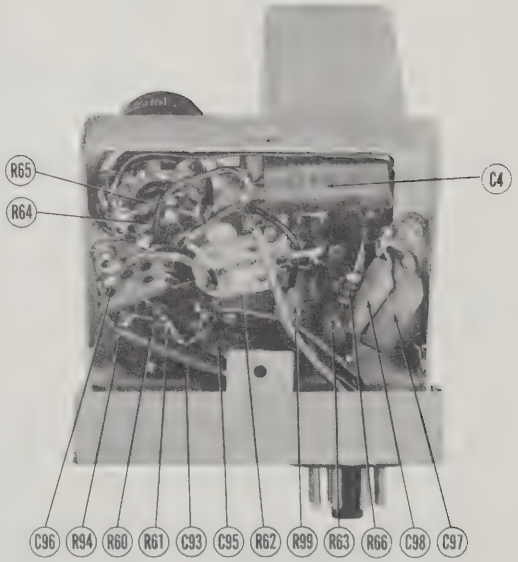

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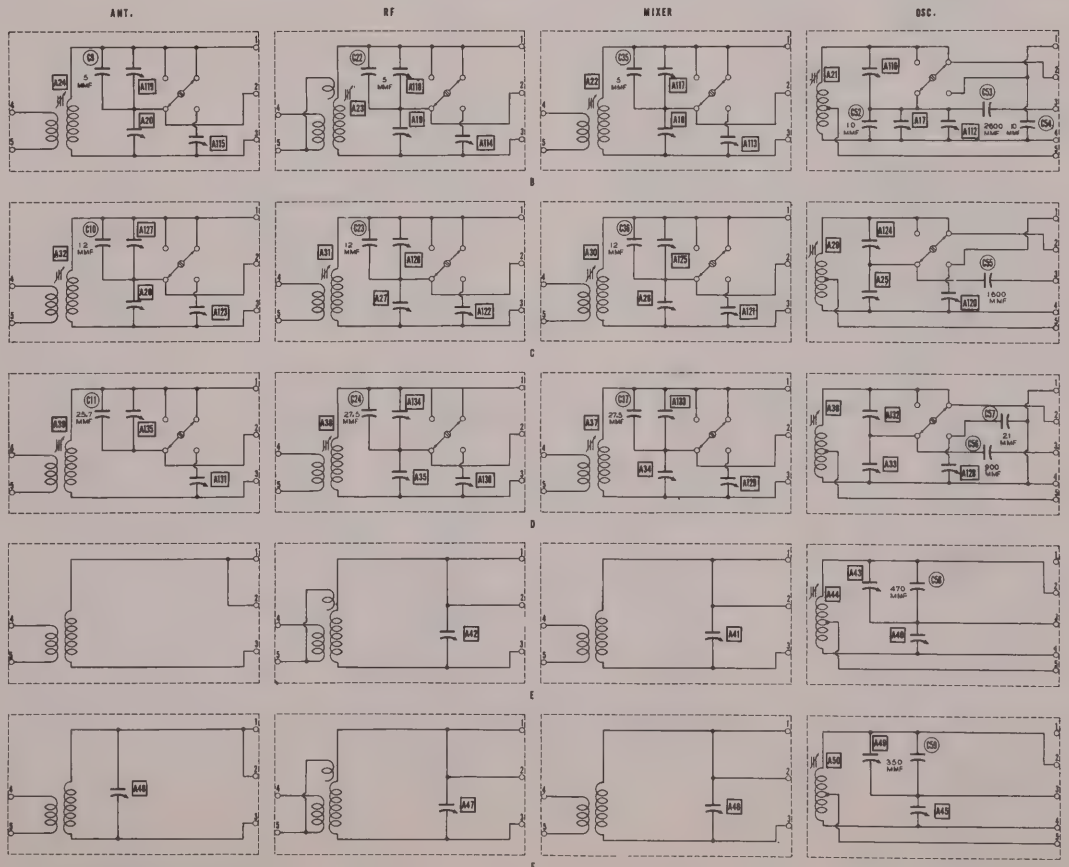

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ALIGNMENT INSTRUCTIONS (CONT.)

1st RF STAGE ALIGNMENT WITH LOW IMPEDANCE TRANSMISSION LINE

If a low impedance transmission line is to be used with the receiver it may be necessary to realign the first RF amplifier at the high frequency end of each band.

GENERAL COVERAGE ALIGNMENT

Set the bandspread switch to "General Coverage" position. Coil sets A, D, E and G do not have a first RF trimmer but is peak tuned by the antenna trimmer control on front panel of receiver.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	COIL SET	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
63.	Direct	High side to antenna terminal "A". Low side to chassis.	14.4MC (400 ∿ Mod.)	Band B	Tune for max. output	Across voice coil	A20 (pos. 2)	Adjust for maximum output.
64.	Direct	"	7.3MC	Band C	"	"	A28 (pos. 2)	"
65.	Direct	"	900KC	Band F	"	"	A48 (pos. 2)	"
66.	Direct	"	200KC	Band H	"	"	A59 (pos. 2)	"
67.	Direct	"	100KC	Band J	"	"	A65 (pos. 2)	"
68.	Direct	"	30MC	Band AA	"	"	A71 (pos. 1)	"
69.	Direct	"	35MC	Band AB	"	"	A83 (pos. 2)	"
70.	Direct	"	21.5MC	Band AC	"	"	A95 (pos. 1)	"

BANDSPREAD ALIGNMENT

Set the bandspread switch to "Bandspread" position.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	COIL SET	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
71.	Direct	High side to antenna terminal "A". Low side to chassis.	30MC (400 ∿ Mod.)	Band A	Tune for max. output	Across voice coil	A107 (pos. 1)	Adjust for maximum output.
72.	Direct	"	14.4MC	Band B	"	"	A115 (pos. 1)	"
73.	Direct	"	7.3MC	Band C	"	"	A123 (pos. 1)	"
74.	Direct	"	4MC	Band D	"	"	A131 (pos. 1)	"

"S" METER ADJUSTMENT

Before attempting this adjustment set the controls as follows: Set the RF gain control at zero, the AVC switch to "AVC", the control switch to "AM" and the AC switch to "ON".

Adjust the "S" meter balancing control R6 for a zero reading on the "S" meter.

NARROW BAND FM ADAPTOR ALIGNMENT

It will be necessary to realign primary trimmer A6 as follows: Plug in the adaptor and adjust all controls for normal "AM" operation. Disconnect the antenna and adjust A6 for maximum background noise.

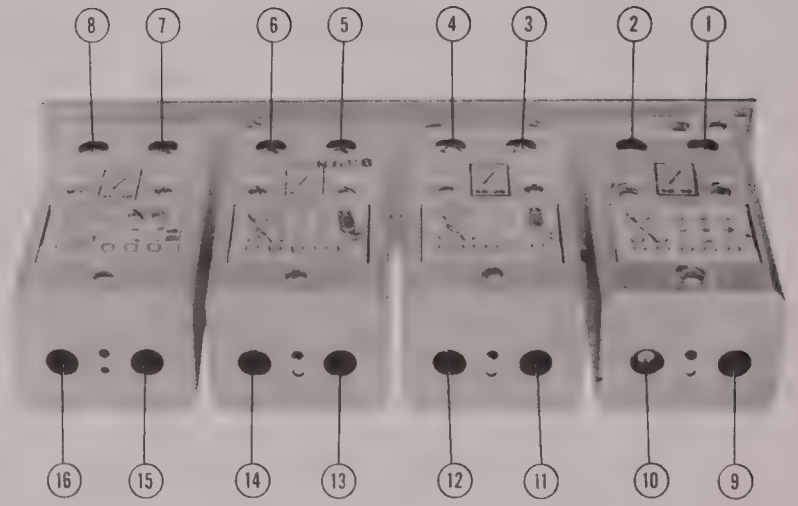
The NFM-50 adaptor unit is pre-aligned at the factory and realignment should not be required unless the adaptor is accidently misaligned.

If the adaptor requires alignment set the controls as follows: Control switch to "NFM", the selectivity switch to "OFF", the limiter control to "OFF", the B+ switch to "ON", the AVC switch to "AVC", the RF gain control to "10". Plug in coil set "E" if available, if not plug in coil set "D".

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	COIL SET	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
75.	300Ω carbon res.	High side thru antenna terminal "A". Low side to other antenna terminal "A".	1500KC (Unmod.) or 2.25MC	Band E or Band D	Tune for max. deflection.	DC Probe to Point A. Common to chassis.	A136 A137	Detune A136 and A137 by turning adjustment screws counter-clockwise as far as possible. Then adjust A136 for maximum deflection. Adjust A137 for zero reading.
76.	"	"	"	"	"	Not used	A138	Adjust for a null in audio output. Readjust A137 and A138 until a zero reading and a null in audio output is obtained.

CRYSTAL CALIBRATOR UNIT ADJUSTMENT

Set controls of receiver for normal CW operation.
Set the front panel calibrate switch at the 100KC position.
Tune in the signal from WWV and adjust A139 so that 100KC signal harmonic is zero beat with the signal received from WWV.



VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Top Cap
V 1	6BA6	▲0V. #-.3VDC	1.4VDC	0V.	6.3VAC	245VDC	120VDC	1.4VDC		
V 2	6BA6	▲0V. #-.3VDC	34VDC	0V.	6.3VAC	245VDC	120VDC	34VDC		
V 3	6BE6	0V.	1.2VDC	6.3VAC	0V.	245VDC	85VDC	0V.		
V 4	6C4	105VDC	0V.	6.3VAC	0V.	105VDC	§-7.6VDC	0V.		TOP CAP
V 5	6K7	0V.	0V.	245VDC	130VDC	37VDC	35VDC	6.3VAC	37VDC	▲0V. #-.2VDC
V 6	6K7	0V.	0V.	245VDC	130VDC	35VDC	0V.	6.3VAC	35VDC	▲0V. #-.2VDC
V 7	6J7	0V.	0V.	¶60VDC	¶22VDC	0V.	¶245VDC	6.3VAC	0V.	-.4VDC
V 8	6H6	0V.	0V.	-.5VDC	0V.	-3VDC	-3VDC	5VAC	0V.	
V 9	6SN7GT	▲0V. #-.6VDC	30VDC	0V.	30VDC	190VDC	60VDC	0V.	6.3VAC	
V 10	6H6	0V.	0V.	42VDC ▲0V.	42VDC ▲0V.	42VDC ▲0V.	35VDC ▲0V.	5VAC	42VDC ▲0V.	
V 11	6SJ7	0V.	0V.	4.7VDC	0V.	4.7VDC	115VDC	6.3VAC	34VDC	
V 12	6V6GT	0V.	0V.	245VDC	250VDC	0V.	245VDC	6.3VAC	16VDC	
V 13	6V6GT	0V.	0V.	245VDC	250VDC	0V.	250VDC	6.3VAC	16VDC	
V 14	OB2	105VDC	0V.	0V.	0V.	105VDC	0V.	0V.		
V 15	5U4G	0V.	295VDC	0V.	255VAC	0V.	255VAC	0V.	295VDC	
V 16	6AK6	♦-.5VDC	0V.	0V.	6.3VAC	♦3.4VDC	♦70VDC	0V.		
V 17	6SK7	0V.	0V.	7.3VDC	0V.	7.3VDC	120VDC	6.3VAC	210VDC	
V 18	6H6	0V.	0V.	-.1VDC	.4VDC	-.4VDC	-.4VDC	6.3VAC	-.1VDC	

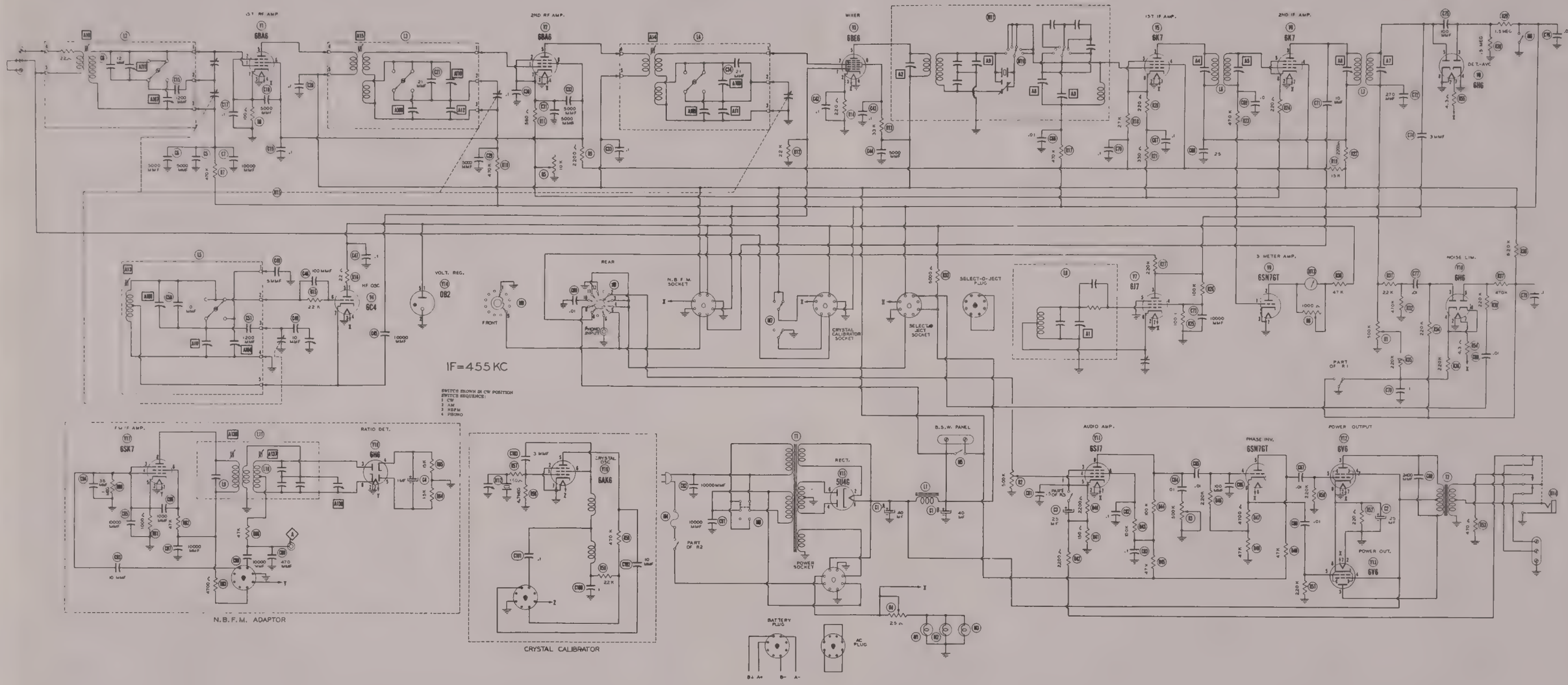
FUNCTION SWITCH IN "AM" POSITION UNLESS OTHERWISE NOTED.
LIMITER SWITCH "OFF" UNLESS OTHERWISE NOTED.
B+ SWITCH MUST BE ON FOR THESE MEASUREMENTS.
CALIBRATION SWITCH "OFF" UNLESS OTHERWISE NOTED.
▲ AVC SWITCH "OFF".
AVC SWITCH "ON".
▲ LIMITER SWITCH "ON" AND CONTROL TURNED CLOCKWISE.
¶ FUNCTION SWITCH IN "CW" POSITION.
♦ CALIBRATION SWITCH 100 or 1000 POSITION.
§ TAKEN WITH VACUUM TUBE VOLTMETER.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Top Cap
V 1	6BA6	▲470KΩ #3.5Meg.	100Ω	0Ω	.1Ω	†290Ω	†17KΩ	100Ω		
V 2	6BA6	▲470KΩ #3.5 Meg.	10KΩ	0Ω	.1Ω	†290Ω	†17KΩ	10KΩ		
V 3	6BE6	22KΩ	220Ω	.1Ω	0Ω	†290Ω	†33KΩ	.1Ω		
V 4	6C4	†5.3KΩ	0Ω	.1Ω	0Ω	†5.3KΩ	22KΩ	0Ω		
V 5	6K7	0Ω	0Ω	†2.5KΩ	†15KΩ	10KΩ	10KΩ	.1Ω	10KΩ	▲470KΩ #3.5 Meg.
V 6	6K7	0Ω	0Ω	†2.5KΩ	†15KΩ	10KΩ	Inf.	.1Ω	10KΩ	▲470KΩ #3.5 Meg.
V 7	6J7	0Ω	0Ω	†¶120KΩ	†¶100KΩ	0Ω	†¶ 290Ω	.1Ω	2Ω	47KΩ
V 8	6H6	0Ω	0Ω	▲750KΩ #1.5 Meg.	0Ω	150KΩ ▲300KΩ	150KΩ ▲300KΩ	2.5Ω	0Ω	
V 9	6SN7GT	#3 Meg.	†50KΩ	0Ω	270KΩ	†47KΩ	50KΩ	0Ω	.1Ω	
V 10	6H6	0Ω	0Ω	† 1 Meg. †▲ 350KΩ	220KΩ ▲500KΩ	†1.3Meg. †▲600KΩ	†1.5 Meg. †▲800KΩ	2.5Ω	220KΩ 500KΩ	
V 11	6SJ7	0Ω	0Ω	2.3KΩ	100Ω	2.3KΩ	†147KΩ	.1Ω	†147KΩ	
V 12	6V6GT	0Ω	0Ω	†340Ω	†290Ω	220KΩ	†340Ω	.1Ω	220Ω	
V 13	6V6GT	0Ω	0Ω	†340Ω	†290Ω	220KΩ	†290Ω	.1Ω	220Ω	
V 14	OB2	†5.3KΩ	0Ω	Inf.	0Ω	†5.3KΩ	Inf.	0Ω		
V 15	5U4G	Inf.	45KΩ	Inf.	115Ω	Inf.	115Ω	Inf.	45KΩ	
V 16	6AK6	4.7 Meg.	0Ω	0Ω	.1Ω	† Inf. †♦470KΩ	† Inf. †♦ 22KΩ	0Ω		
V 17	6SK7	0Ω	0Ω	1000Ω	1 Meg.	1000Ω	†50KΩ	.1Ω	†5KΩ	
V 18	6H6	0Ω	0Ω	Inf.	15KΩ	15KΩ	15KΩ	.1Ω	Inf.	

FUNCTION SWITCH IN "AM" POSITION UNLESS OTHERWISE NOTED.
LIMITER SWITCH OFF UNLESS OTHERWISE NOTED.
B+ SWITCH MUST BE ON FOR THESE MEASUREMENTS.
CALIBRATION SWITCH "OFF" UNLESS OTHERWISE NOTED.
▲ AVC SWITCH "OFF".
AVC SWITCH "ON".
▲ LIMITER SWITCH "ON" AND CONTROL TURNED CLOCKWISE.
† MEASURED FROM PIN 8 OF V15.
¶ FUNCTION SWITCH IN "CW" POSITION.
♦ CALIBRATION SWITCH IN 100 or 1000 POSITION.

1. DC-Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.



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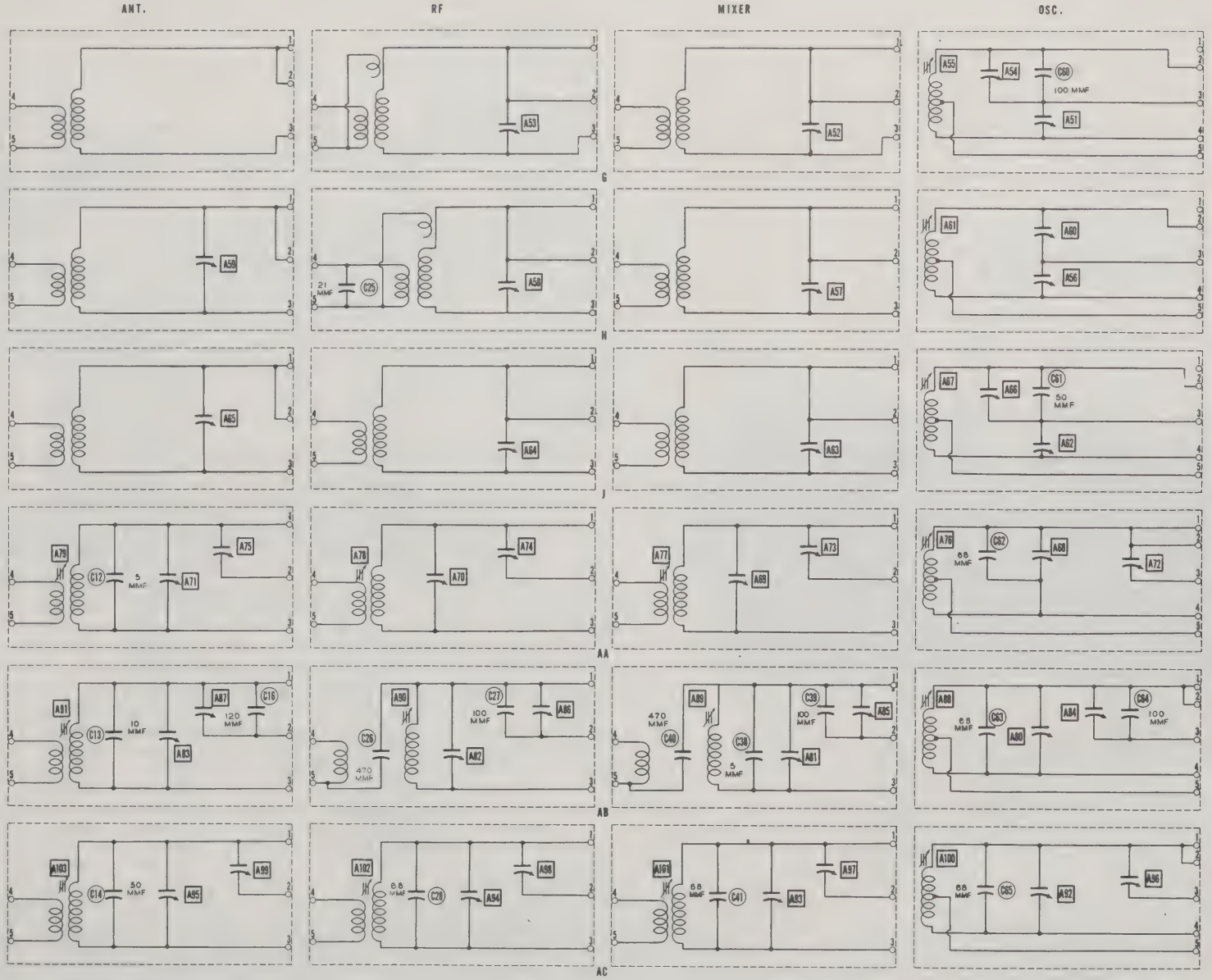
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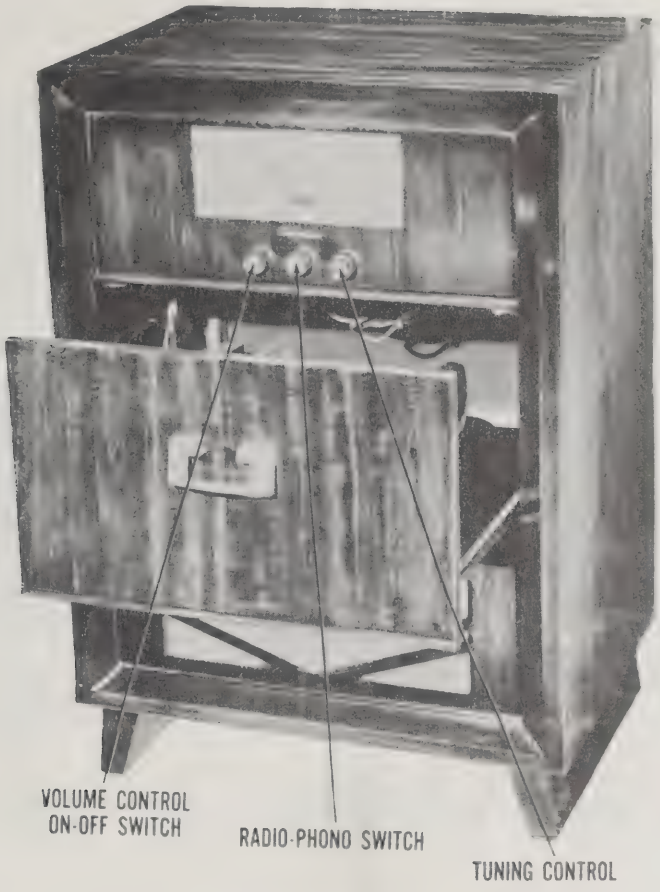
SILVERTONE
MODELS 51, 53 (Ch. 132.887)

SILVERTONE
MODELS 51, 53 (Ch. 132.887)



SILVERTONE
MODELS 51, 53 (Ch. 132.887)

TRADE NAME	Silvertone, Models 51, 53 (Ch. 132.887)
SUPPLIER	Sears, Roebuck and Co., 925 S. Homan St., Chicago, Illinois
TYPE SET	AC Operated Combination Phono-Radio, Superheterodyne Receiver with Loop Antenna
TUBES (SIX)	Types 12SK7GT RF Amp., 12SA7GT Converter, 12SK7GT IF Amp., 12SQ7GT DET-AVC-AF, 35L6GT Power Output, 35Z5GT Rectifier
POWER SUPPLY	110-120 Volts AC — RATING .25 Amp. at 117 Volts AC
TUNING RANGE—BROADCAST	540-1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

To set pointer, turn tuning gang fully closed and set pointer in a horizontal position parallel with bottom edge of dial backing plate.

Turn Radio-Phono switch to "RADIO" position (counter-clockwise)

Use isolation transformer if available. If not connect a .1MFD capacitor in series with low side of signal generator and B-. Loop should be maintained in same relative position to chassis as when receiver is in cabinet.

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.05MFD	High side to pin 8 (Grid) of 12SA7 (V2). Low side to B-.	455KC (400 ∿ Mod.)	Tuning gang fully	Across voice coil	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.		Loop	1400KC	1400KC	"	A5, A6, A7	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

FOR SERVICE INFORMATION ON RECORD CHANGER SEE SILVERTONE CH. 132.217 SIMILAR TO V-M 910 IN CM3 OR SILVERTONE CH. 132.216 SIMILAR TO V-M 950 IN PHOTOFACT FOLDER SET #107 FOLDER #13 OR CM3. Ch. 132.217 CHANGER USED IN MODEL 51 AND Ch. 132.216 USED IN MODEL 53

HOWARD W. SAMS & CO., INC. • Indianapolis Indiana

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: SILVERTONE PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	RF Amp.	12SK7GT	12SK7GT	8N	
V2	Converter	12SA7GT	12SA7GT	8AD	
V3	IF Amp.	12SK7GT	12SK7GT	8N	
V4	DET.-AVC-AF	12SQ7GT	12SQ7GT	8Q	
V5	Power Output	35L6GT	35L6GT	7AC	
V6	Rectifier	35Z5	35Z5	6AD	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: SILVERTONE PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	50	150	N22111	PRS150/50-		EDL5515		TVA-2453	Filter-Red
B	50	150		50					Filter
C2	.05	200		P288-05	DF-503	PTE4S5		2TM-S5	AVC Filter
C3	50	500		1468-00005	D6-500	5W5Q5	GP1K-50	1FM-45	Osc. Grid Cap.
C4	220			SI220	D6-221	5W5T25	GP2K-220	19C13	Diode RF Filter
C5	.05	400		P488-05	DF-503	PTE4S5		4TM-S5	Phono Isolation
C6	.01	400		P488-01	D6-103	PTE4S1	811-01	4TM-S1	Audio Coupling
C7	220			SI220	D6-221	5W5T25	GP2K-220	19C13	AF Amp. Plate Byp.
C8	.01	400		P488-01	D6-103	PTE4S1	811-01	4TM-S1	Audio Coupling
C9	.02	400		P488-02	DF-203	PTE4S2		4TM-S2	Output Plate Byp.
C10	.05	400		P488-05	DF-503	PTE4S5		72P51	Line Isolation
C11	.05	400		P488-05	DF-503	PTE4S5		4TM-S5	Line Filter

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: SILVERTONE PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	INSTALLATION NOTES
R1A	500KΩ	½	N22963	Q13-133	AG-60-Z	B-60-S	Volume control
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Attach to R1A per instructions
C	Switch		Not Req.	76-1	SWB	Not Req.	Attach to R1A per instructions

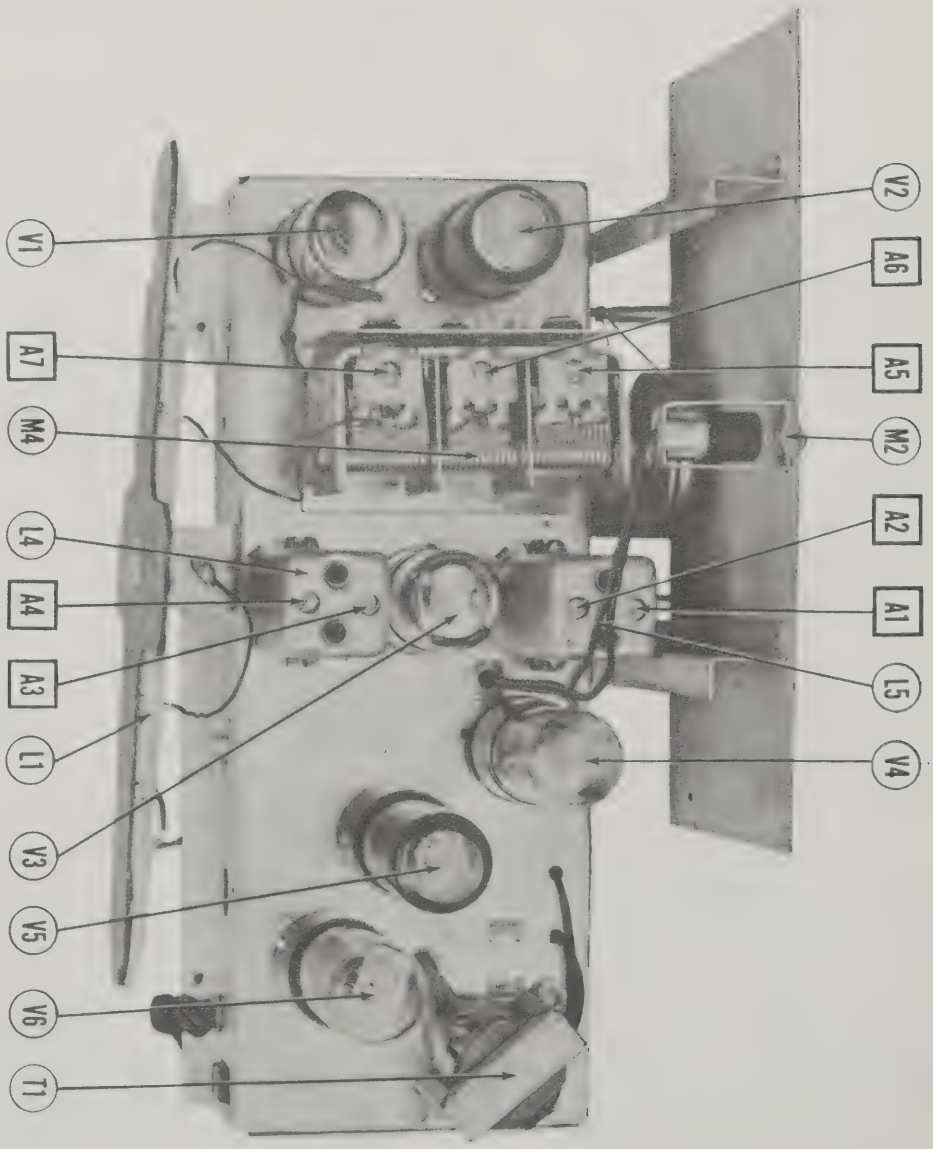
RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: SILVERTONE PART No.	IRC PART No.	IDENTIFICATION CODES
R2	1000Ω	½			Parasitic Supp.
R3	22KΩ	½		BTS-22K	Osc. Grid
R4	6.8 Meg.	½		BTS-6.8 Meg.	AVC Network
R5	1 Meg.	½		BTS-1 Meg.	Diode Filter
R6	3.3 Meg.	½		BTS-3.3 Meg.	AF Grid
R7	330KΩ	½		BTS-330K	AF Plate
R8	470KΩ	½		BTS-470K	Output Grid
R9	150Ω	½		BTS-150	Output Cathode
R10	1200Ω	2		BW-2-1200	Filter
R11	15Ω	½			Surge Limiter
R12	150Ω	½		BTS-150	Dial Lamp Shunt
R13	330KΩ	½		BTS-330K	Isolation

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: SILVERTONE PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	INSTALLATION NOTES
T1	2800Ω	3.5Ω	100Ω Tap ② 6Ω	.6Ω	N23407	A-3876	A-3031	RO-2	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA: SILVERTONE PART No.	JENSEN PART No.	QUAM PART No.	INSTALLATION NOTES
	FIELD	V. C. IMP.		ST-108		
SP1	PM	3.5Ω	N23406	MOD. P6-X	6A15	
	CONE DIA.	V. C. DIA.				
SP2	6"	9/16"				

R F COILS

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: SILVERTONE PART No.	MEISSNER PART No.	
L1	Loop Ant.	.2Ω	2.1Ω	N23159		
L2	RF Coil	.4Ω	4.3Ω	N23163	14-1072	
L3A	Osc. Coil	.7Ω	6.8Ω	N23751	14-1073	Used with tuning cap, part #N23743
B	Osc. Coil			N23160		Used with tuning cap, part #N23155
L4	1st IF	25Ω	25Ω	N23161	16-6666	
L5	2nd IF	25Ω	25Ω	N23162	16-6667	

DIAL LIGHTS

ITEM No.	BASE TYPE	VOLTS	AMPS.	BEAD COLOR	REPLACEMENT DATA: SILVERTONE PART No.		NOTES
M2	Bayonet	6-8	.15	Brown			Type #47

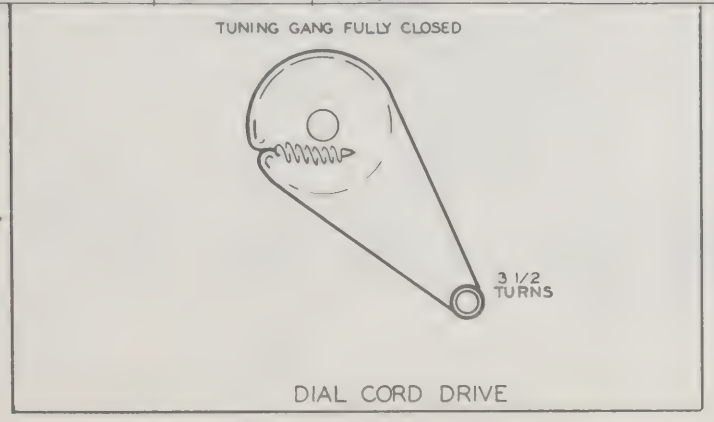
PHONO CARTRIDGE and NEEDLE

ITEM No.	REPLACEMENT DATA: SILVERTONE PART No.	ASTATIC PART No. CARTRIDGE	ASTATIC PART No. NEEDLE	SHURE PART No. CARTRIDGE	SHURE PART No. NEEDLE	REMARKS
M1		GC-78-J	G-78(J)			MODEL 51

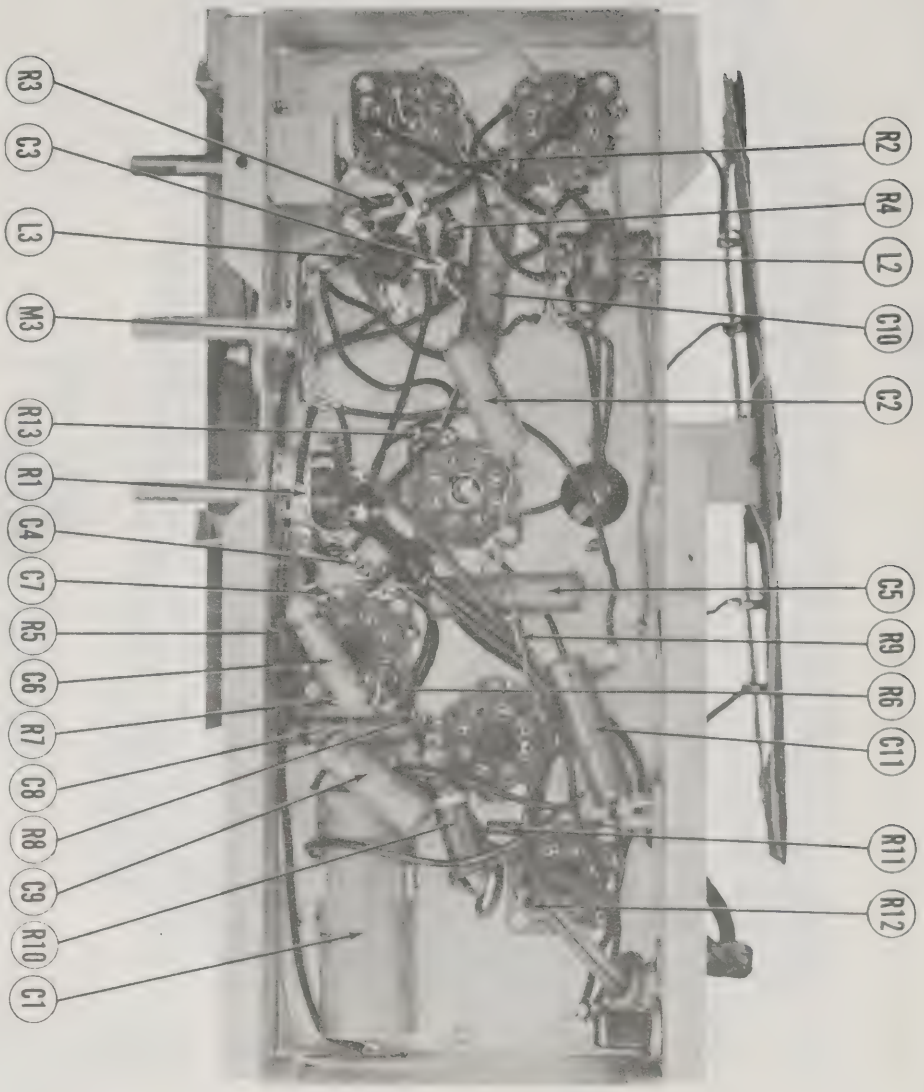
ASTATIC AND SHURE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED.

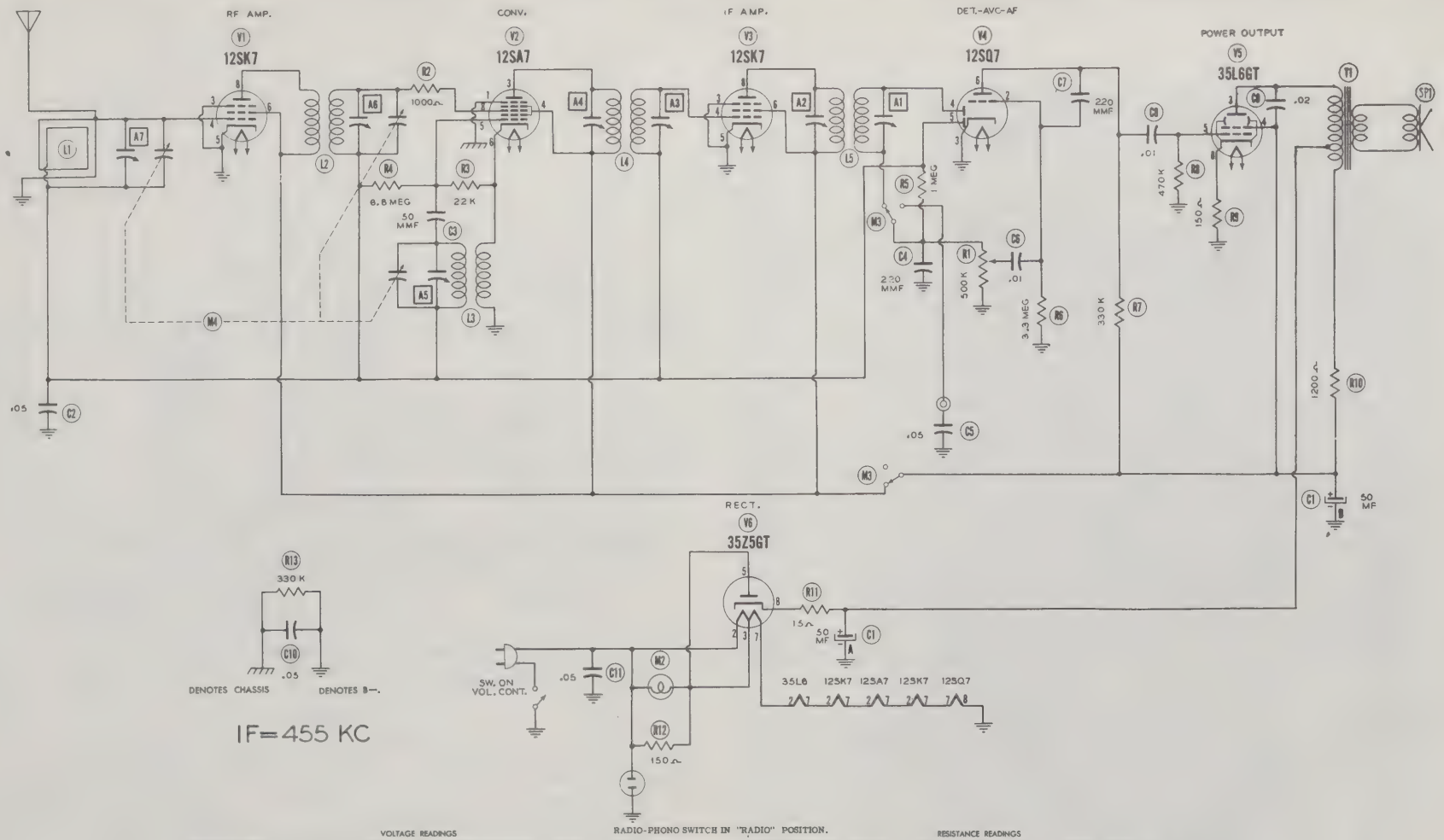
MISCELLANEOUS

ITEM No.	PART NAME	SILVERTONE PART No.	NOTES
M3	Switch		Radio-Phono
M4A	3 Gang Var. Cap.	N23743	(32-507MMF, 24-352MMF, 22-197MMF)
B	3 Gang Var. Cap.	N23155	Early productions
	Dial Pointer	N22956-1	
	Dial Scale	N23430	
	Knob	N23450-1C	On-Off volume
	Knob	N23450-1B	Radio-Phono
	Knob	N23450-1A	Tuning



CHASSIS—BOTTOM VIEW





RADIO-PHONO SWITCH IN "RADIO" POSITION.

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	12SK7GT	0V.	48VAC	0V.	-.9VDC	0V.	80VDC	36VAC	80VDC
V 2	12SA7GT	0V.	36VAC	80VDC	80VDC	8-7VDC	0V.	25VAC	-.9VDC
V 3	12SK7GT	0V.	25VAC	0V.	-.9VDC	0V.	80VDC	12VAC	80VDC
V 4	12SQ7GT	0V.	-.8VDC	0V.	-.8VDC	-.9VDC	40VDC	12VAC	0V.
V 5	35L6GT	0V.	85VAC	108VDC	80VDC	0V.	0V.	48VAC	4.6VDC
V 6	35Z5GT	0V.	117VAC	110VAC	0V.	110VAC	112VDC	85VAC	115VDC

‡ TAKEN WITH VACUUM TUBE VOLTMETER.

RESISTANCE READINGS

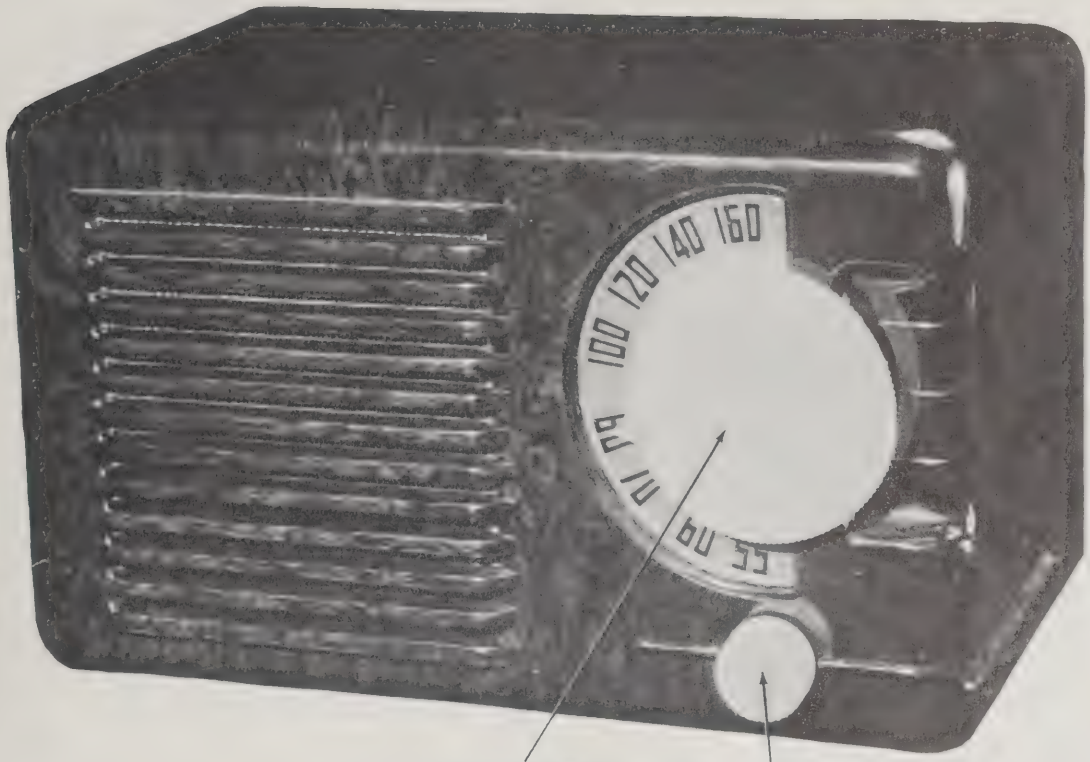
Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	12SK7GT	330KΩ	50Ω	0Ω	1.5 Meg.	0Ω	†1.2KΩ	38Ω	†1.2KΩ
V 2	12SA7GT	330KΩ	38Ω	†1.2KΩ	†1.2KΩ	22KΩ	.7Ω	27Ω	1.5 Meg.
V 3	12SK7GT	330KΩ	27Ω	0Ω	1.5 Meg.	0Ω	†1.2KΩ	16Ω	†1.2KΩ
V 4	12SQ7GT	330KΩ	3.3 Meg.	0Ω	500KΩ	1.5 Meg.	†330KΩ	16Ω	0Ω
V 5	35L6GT	Inf.	85Ω	†110Ω	†1.2KΩ	470KΩ	Inf.	50Ω	150Ω
V 6	35Z5GT	Inf.	115Ω	110Ω	Inf.	110Ω	†200Ω	85Ω	70KΩ

† MEASURED FROM PIN 8 OF V6.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

SONORA
MODEL YB-299



SONORA
MODEL YB-299

SONORA MODEL YB-299

TRADE NAME	Sonora, Model YB-299
MANUFACTURER	Sonora Radio and Tel. Corp., 325 No. Hoyne Ave., Chicago, Illinois
TYPE SET	AC-DC Operated Superheterodyne Receiver with Loop Antenna
TUBES (FIVE)	Types 12BE6 Converter, 12BA6 IF Amp., 12AV6 DET-AVC-AF, 50C5 Power Output, 35W4 Rectifier
POWER SUPPLY	110-120 Volts AC-DC RATING .25 Amp. at 117 Volts AC
TUNING RANGE—BROADCAST	540-1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

To set pointer, turn tuning cap fully closed and set pointer parallel with base of dial.
Use isolation transformer if available. If not connect a .1MFD capacitor in series with low side of signal generator and B-.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.05MFD	High side to pin 7 (Grid) of 12BE6 (V1). Low side to B-.	455KC (400 ∿ Mod.)	Tuning gang fully open	Across voice coil	A1, A2, A3	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.	.05MFD	"	1600KC	"	"	A4	"
3.		Loop	1400KC	Tune for max. output	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

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PARTS LIST AND DESCRIPTIONS

SONORA
MODEL YB-299

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA		RMA BASE TYPE	INSTALLATION NOTES
		SONORA PART No.	STANDARD REPLACEMENT		
V1	Converter	12BE6	12BE6	7CH	
V2	IF Amp.	12BA6	12BA6	7BK	
V3	DET.-AVC-AF	12AV6	12AV6	7BT	
V4	Power Output	50C5	50C5	7CV	
V5	Rectifier	35W4	35W4	5BQ	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						IDENTIFICATION CODES AND INSTALLATION NOTES
	CAP.	VOLT	SONORA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	
C1A	50	150		PRS150/50-30		EDL5315		TVA-2450	Filter-Red
B	30	150							Filter-Yellow
C2	.05	200		P288-05	DF-503	PTE4S5		2TM-S5	AVC Filter
C3	100			SI100NPO	TCZ-100	5R5T1	NPOM-100	36C10	Fixed Trimmer
C4	1000			SI1000	D6-102	1W5D1	GP2L-001	19C1	Diode RF Filter
C5	.006	600		P688-006	D6-562	PTE6D6	811-005	6TM-D6	Audio Coupling
C6	76	500		1468-000075	D6-750	5W5Q7	GP1K-75	1FM-475	AF Amp. Plate
C7	.01	600		P688-01	D6-103	PTE6S1	811-01	6TM-S1	Audio Coupling
C8	.01	600		P688-01	D6-103	PTE6S1	811-01	6TM-S1	Output Plate Byp.
C9	.05	200		P288-05	DF-503	PTE4S5		72P51	Line Isolation
C10	.05	400		P488-05	DF-503	PTE4S5		4TM-S5	Rect. Plate Byp.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA				INSTALLATION NOTES
	RESISTANCE	WATTS	SONORA PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	
R1A	500KΩ	½	N7890	Q13-133	AG-60-Z	BSK-60-S	Volume control
B	Shaft		Not Req.	Not Req.	KSS-3	Not Req.	Attach to R1A per instructions
C	Switch		Not Req.	76-1	SWB	Not Req.	Attach to R1A per instructions

RESISTORS

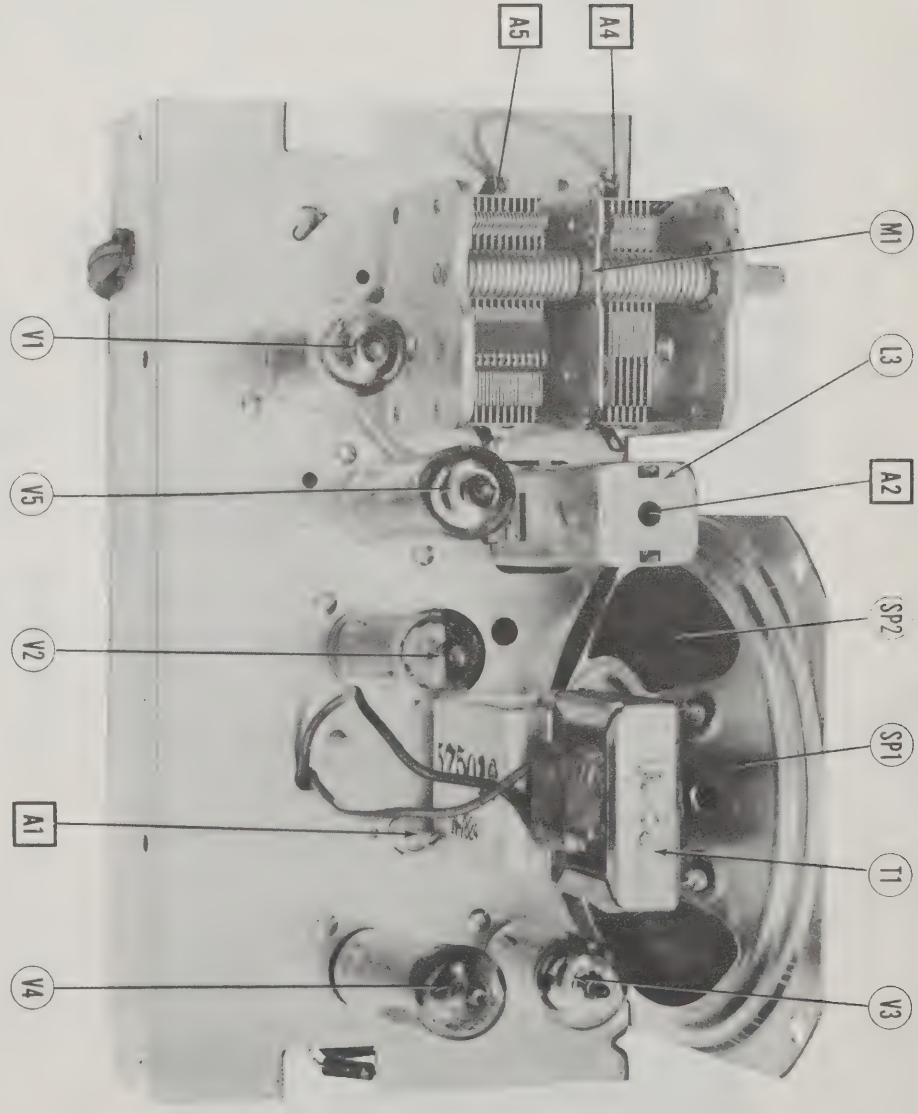
ITEM No.	RATING		REPLACEMENT DATA		IDENTIFICATION CODES
	RESISTANCE	WATTS	SONORA PART No.	IRC PART No.	
R2	22KΩ	½		BTS-22K	Conv. Grid
R3	68Ω	½		BW-½-68	IF Amp. Grid
R4	1 Meg.	½		BTS-1 Meg.	AVC Network
R5	6.8 Meg.	½		BTS-6.8 Meg.	AF Amp. Grid
R6	180KΩ	½		BTS-180K	AF Amp. Plate
R7	500KΩ	½		BTS-470K	Output Grid-See Note 1
R8	220Ω	½		BTS-220	Output Cathode
R9	1200Ω	1		BTA-1200	Filter

Note 1. Some models use two 1 Meg. resistors in parallel in this application.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		SONORA PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
	PRI.	SEC.	PRI.	SEC.					
T1	2500Ω	3.7Ω	255Ω	.6Ω	Part of SP1	A-3332 ①	A-3025 ①		① Bend mounting tabs down and mount on original bracket.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA SONORA PART No.	JENSEN PART No.	QUAM PART No.	INSTALLATION NOTES
	FIELD	V. C. IMP.		ST-113 ②		
SP1	PM	3.7Ω	N-7824	MOD. P4-X	4A07 ②	② Remount output transformer.
	CONE DIA.	V. C. DIA.				
SP2	4"	9/16"				

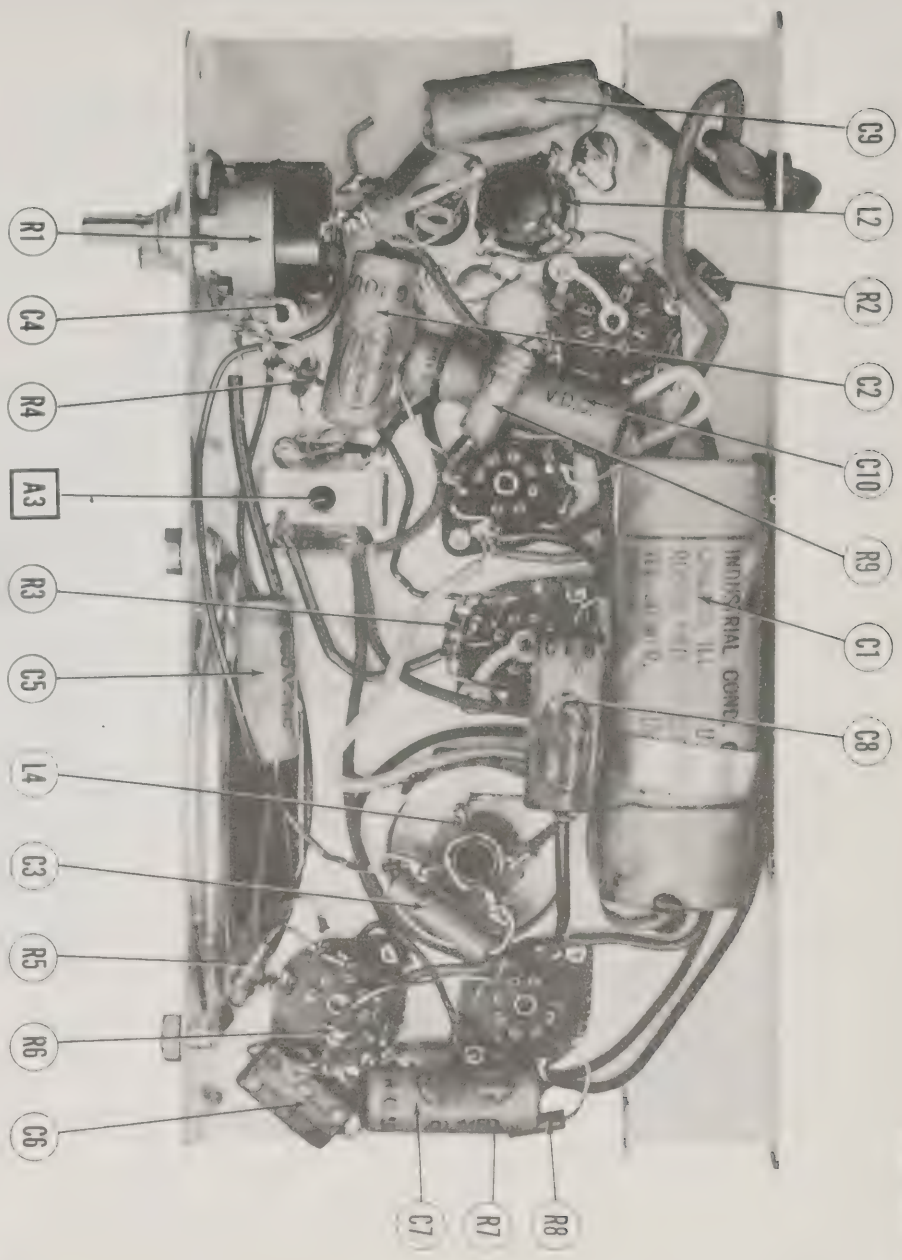
R F COILS

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA SONORA PART No.	REPLACEMENT DATA MEISSNER PART No.
L1	Loop Ant.	3.4Ω			
L2	Osc. Coil	.7Ω	8Ω		14-1073
L3	1st IF	16Ω	16Ω	N7888	16-6758
L4	2nd IF	24Ω	24Ω		16-6758

MISCELLANEOUS

ITEM No.	PART NAME	SONORA PART No.	NOTES
M1	2 Gang Var. Cap.		(27-387MMF, 19-151MMF)

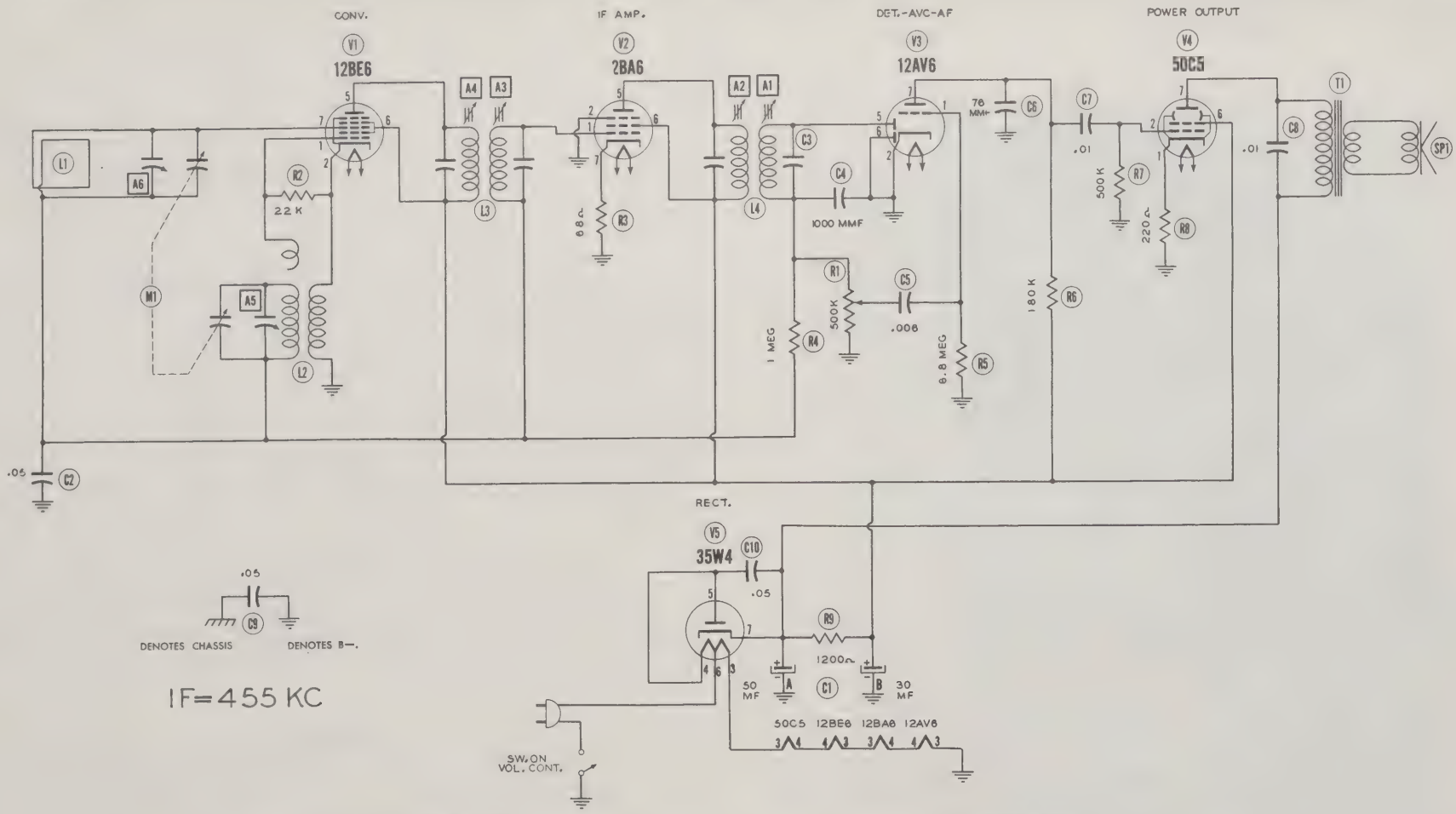
CHASSIS—BOTTOM VIEW



SET 112 FOLDER 9

SONORA MODEL YB-299

SONORA MODEL YB-299



IF=455 KC

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12BE6	§-7.3VDC	0V.	25VAC	36VAC	90VDC	90VDC	-.5VDC
V 2	12BA6	-.1VDC	0V.	25VAC	13VAC	90VDC	90VDC	1VDC
V 3	12AV6	-.6VDC	0V.	0V.	13VAC	-.4VDC	0V.	55VDC
V 4	50C5	7.3VDC	.1VDC	87VAC	36VAC	.1VDC	90VDC	105VDC
V 5	35W4	115VDC	0V.	87VAC	110VAC	110VAC	117VAC	115VDC

§ TAKEN WITH VACUUM TUBE VOLTMETER.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12BE6	22KΩ	.7Ω	25Ω	37Ω	†1.2KΩ	†1.2KΩ	1.5 Meg.
V 2	12BA6	1.5 Meg.	0Ω	25Ω	14Ω	†1.2KΩ	†1.2KΩ	68Ω
V 3	12AV6	6.8 Meg.	0Ω	0Ω	14Ω	500KΩ	0Ω	†180KΩ
V 4	50C5	220Ω	500KΩ	90Ω	37Ω	500KΩ	†1.2KΩ	†255Ω
V 5	35W4	†0Ω	Inf.	90Ω	120Ω	120Ω	115Ω	140KΩ

† MEASURED FROM PIN 7 OF V5.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of + 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

PHOTOFACT* Folder

TRANSVISION

MODEL WRS-3

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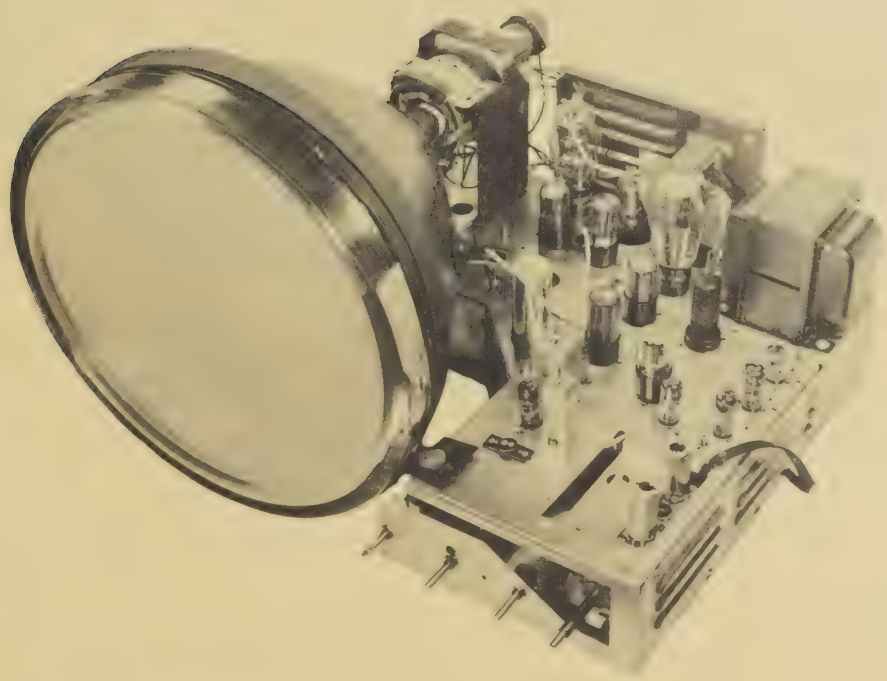

TRANSVISION
MODEL WRS-3

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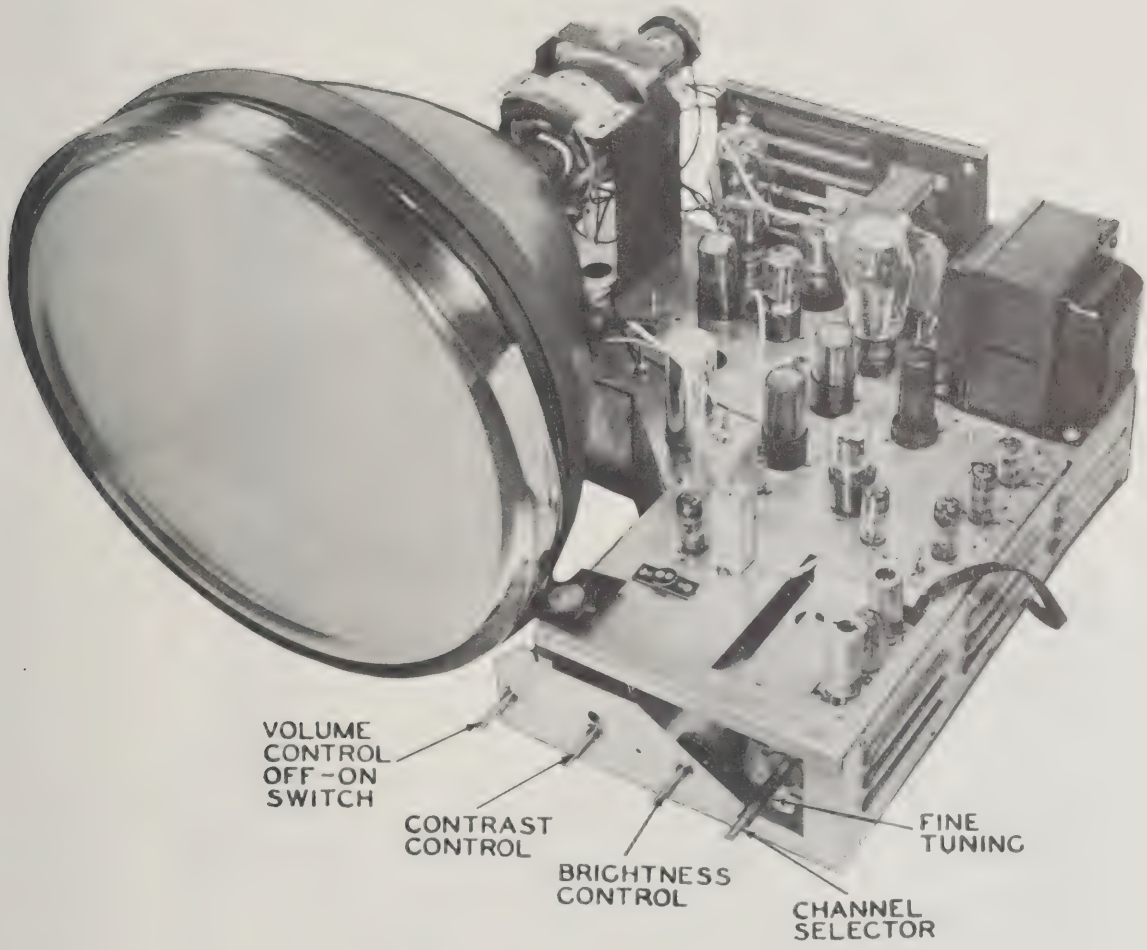

TRANSVISION
MODEL WRS-3

TRADE NAME	Transvision, Model WRS-3
MANUFACTURER	Transvision Inc., New Rochelle, New York
TYPE SET	Television Receiver
TUBES	Twenty One
POWER SUPPLY	110 - 120 Volts AC - 60 Cycle — RATING 2.3 Amperes at 117 Volts AC
TUNING RANGE-	Channels 2 thru 13

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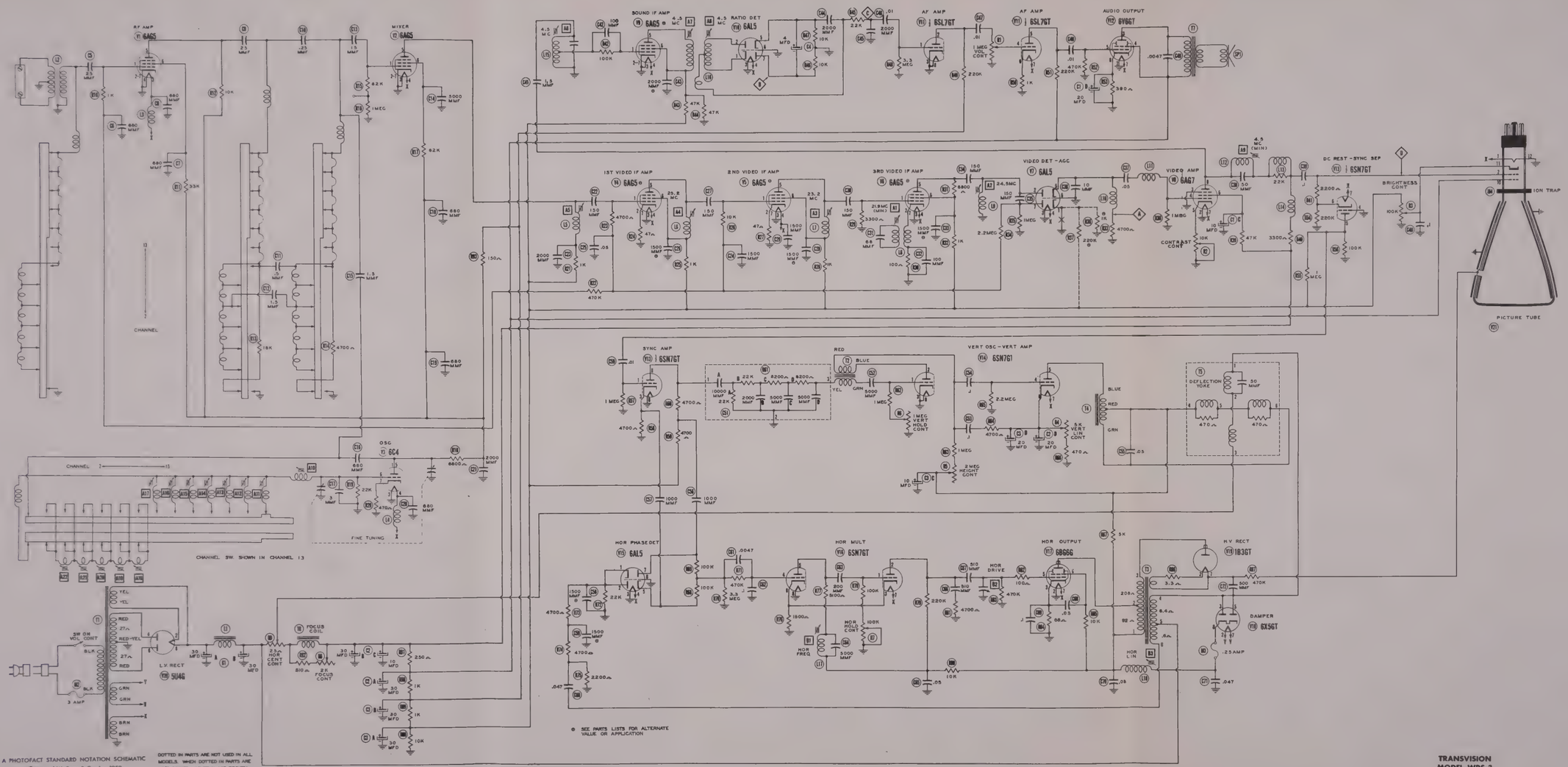

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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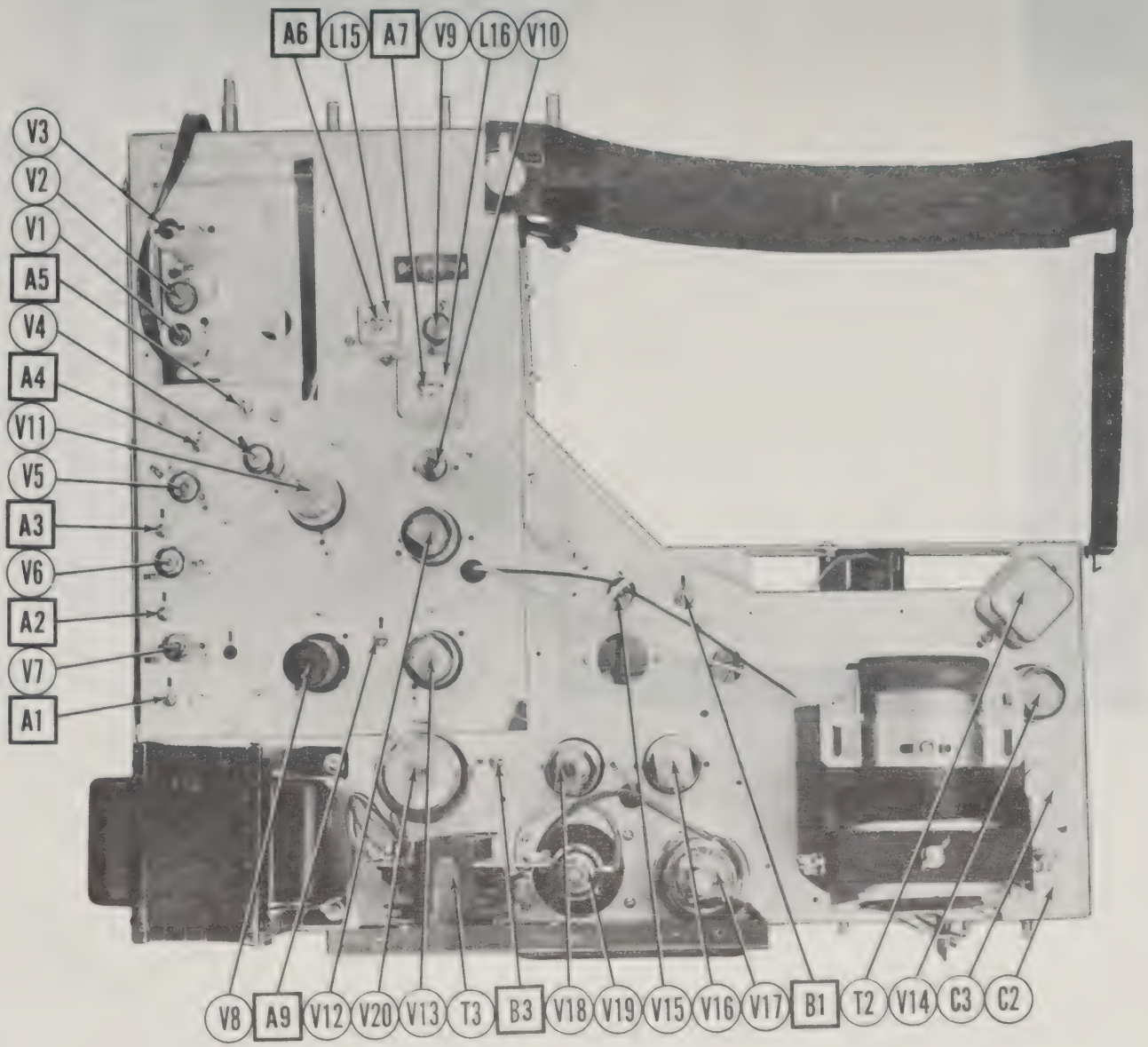
DOTTED IN PARTS ARE NOT USED IN ALL MODELS. WHEN DOTTED IN PARTS ARE USED POINTS MARKED X ARE BROKEN

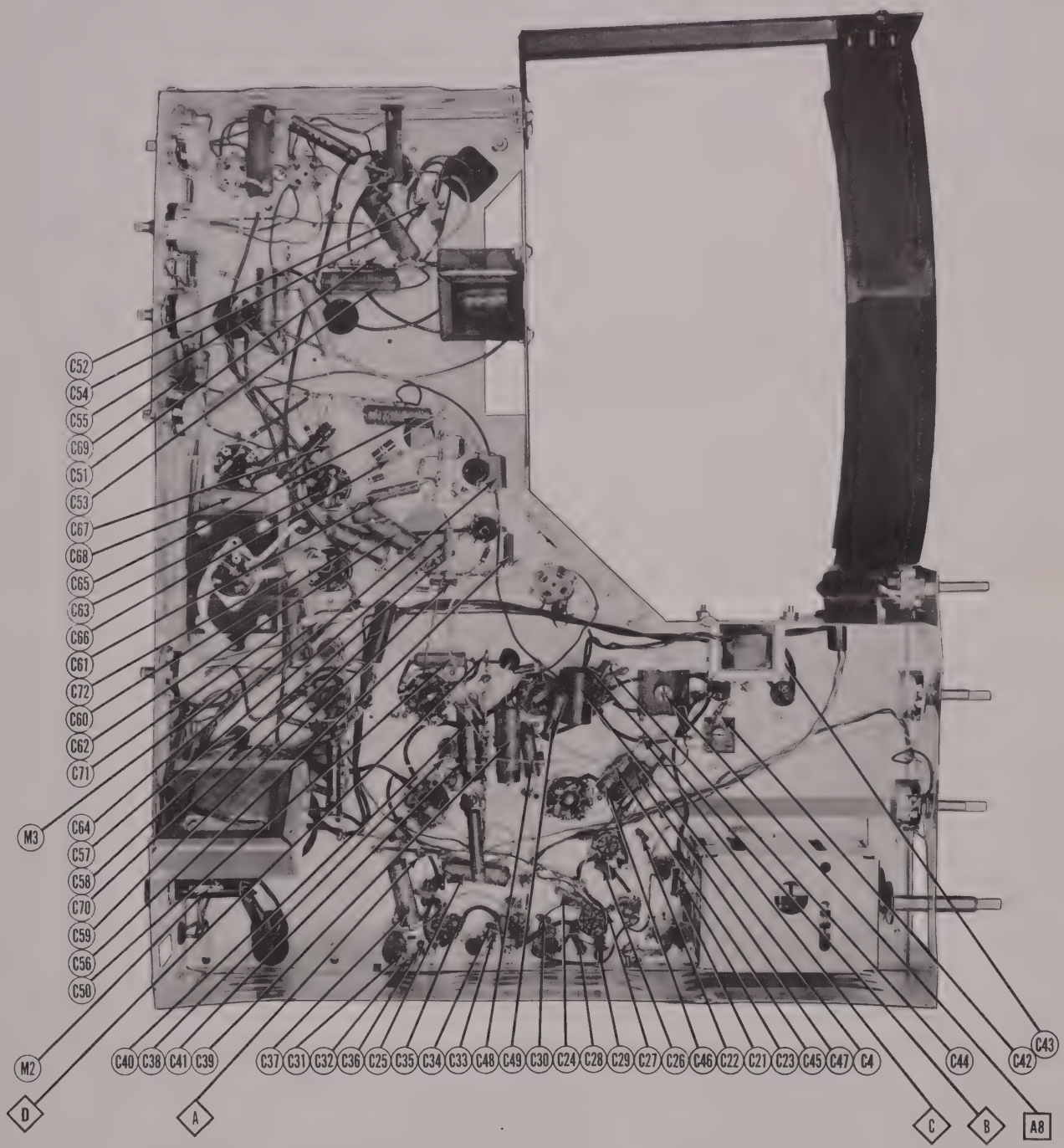
⊕ SEE PARTS LISTS FOR ALTERNATE VALUE OR APPLICATION

TRANSVISION
MODEL WRS-3

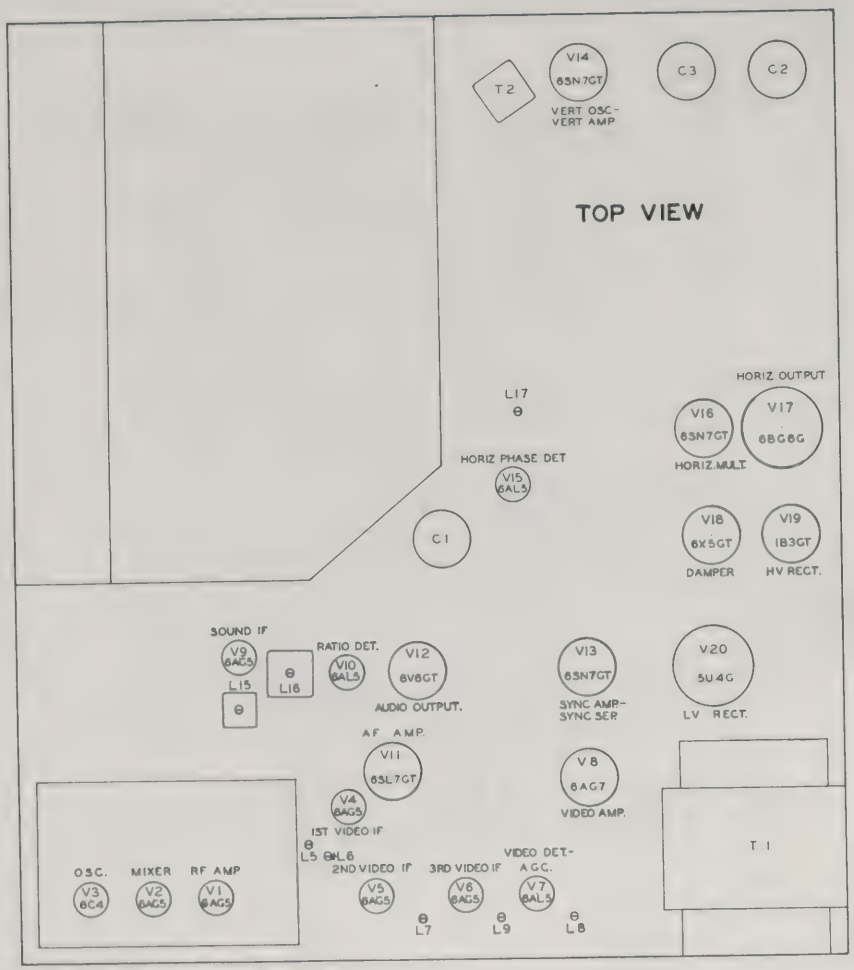
TRANSVISION
MODEL WRS-3

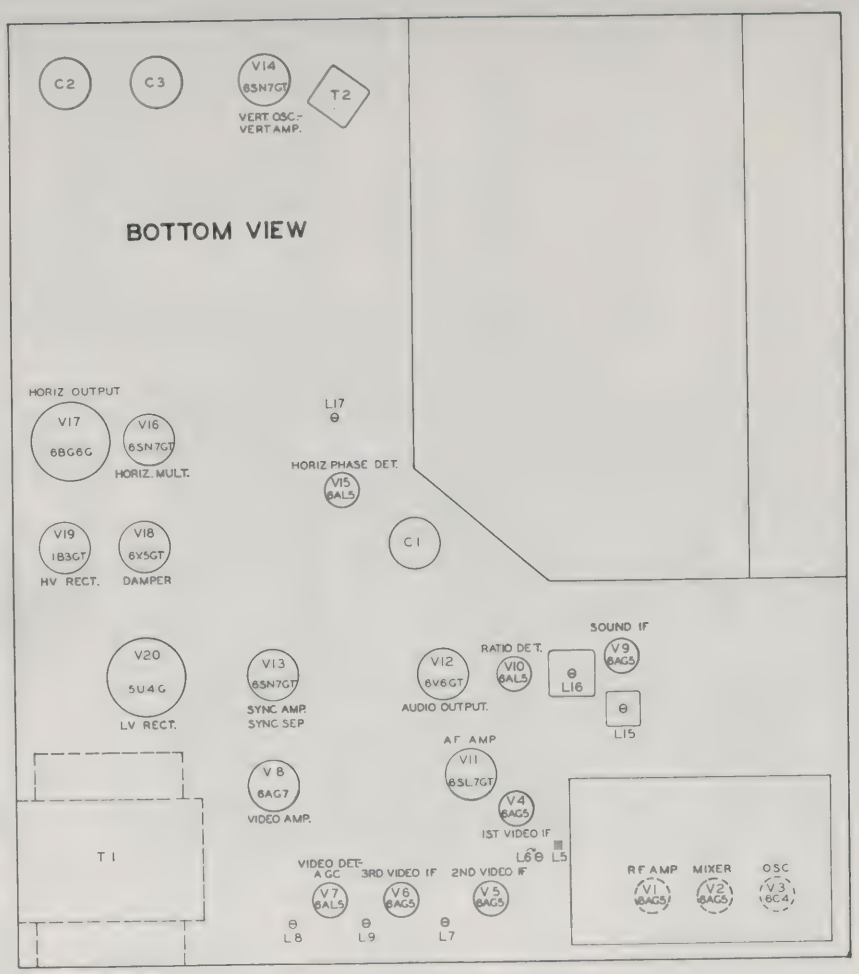


CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW-CAPACITOR AND ALIGNMENT IDENTIFICATION





TUBE PLACEMENT CHART

TRANSVISION
MODEL WRS-3

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

If receiver is to be aligned with picture tube removed the high voltage lead should be securely taped and dressed away from the chassis.

VIDEO IF ALIGNMENT

Remove the local oscillator tube (V3) from its socket to prevent erroneous indications.
Connect the negative terminal of a 3 volt battery to the junction of R23 and C25 and the positive terminal chassis.
Connect the synchronized sweep voltage from the signal generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Direct	High side to ungrounded tube shield floating over mixer tube (V2). Low side to chassis.	Not used	21.9MC	Any	Use VTVM. DC Probe to Point (A). Common to chassis.	A1	Adjust for MINIMUM deflection.
2.	Direct	"	"	24.5MC	"	"	A2	Adjust for maximum deflection.
3.	Direct	"	"	23.2MC	"	"	A3	"
4.	Direct	"	"	25.2MC	"	"	A4	"
5.	Direct	"	24MC (10MC SWP)	21.9MC 22.5MC 26.4MC	"	Vert. Amp. to Point (A). Low side to chassis.	A5	Adjust for response curve similar to figure 1. The 22.5MC sand 26.4MC should be at 50% response. If necessary, slightly retouch A2 thru A4 for proper response.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
6.	.001MFD	High side to pin 4 (Grid) of 6AG7 (V8). Low side to chassis.	4.5MC	Any	DC Probe to Point (B). Common to chassis.	A6, A7	Adjust for maximum deflection.
7.	.001MFD	"	"	"	DC Probe to Point (C). Common to chassis.	A8	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60 ∿ modulation and 450KC sweep. Use 120 ∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
6.	.001MFD	High side to pin 4 (Grid) of 6AG7 (V8). Low side to chassis.	4.5MC (450KC Sweep)	4.5MC	Any	Vert. Amp. to Point (B). Low side to chassis.	A6, A7	Disconnect stabilizer capacitor C4. Adjust for maximum amplitude and symmetry as per figure 2.
7.	.001MFD	"	"	"	"	Vert. Amp. to Point (C). Low side to chassis.	A8	Reconnect capacitor C4. Adjust A9 to place 4.5MC at center of crossover lines as per figure 3. SLIGHTLY retouch A8 for maximum amplitude and straightness of crossover lines.

4.5MC TRAP ADJUSTMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
8.	.001MFD	High side to pin 4 (Grid) of 6AG7 (V8). Low side to chassis.	4.5MC	Any	DC Probe thru detector probe as shown in figure 4 to point (D). Common to chassis.	A9	Adjust for MINIMUM deflection.

OSCILLATOR ALIGNMENT

Replace the local oscillator tube in its socket.
If any individual channel oscillator adjustment screws for channels 7 thru 13 show insufficient range with the fine tuning control at the mid-position of its range, it will be necessary to adjust the high band oscillator padder A10. If A10 is adjusted, readjustment of all high band oscillator adjustments will be necessary.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	Two 120Ω carbon res.	Across antenna terminals with 120Ω in each lead.	213MC (10MC SWP)	211.25MC 215.75MC	13	Vert. Amp. to Point (A). Low side to chassis.	A11	Adjust to place video marker as shown in figure 5.
			207MC (10MC SWP)	205.25MC 209.75MC	12		A12	
			201MC (10MC SWP)	199.25MC 203.75MC	11		A13	
			195MC (10MC SWP)	193.25MC 197.75MC	10		A14	
			189MC (10MC SWP)	187.25MC 191.75MC	9		A15	
			183MC (10MC SWP)	181.25MC 185.75MC	8		A16	
			177MC (10MC SWP)	175.25MC 179.75MC	7		A17	
			85MC (10MC SWP)	83.25MC 87.75MC	6		A18	
			79MC (10MC SWP)	77.25MC 81.75MC	5		A19	
			69MC (10MC SWP)	67.25MC 71.75MC	4		A20	
			63MC (10MC SWP)	61.25MC 65.75MC	3		A21	
			57MC (10MC SWP)	55.25MC 59.75MC	2		A22	

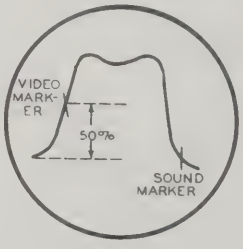


FIG.5

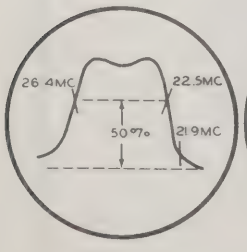


FIG.1

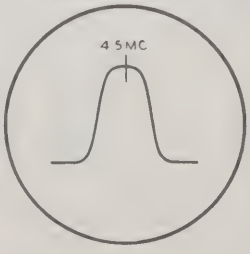


FIG. 2

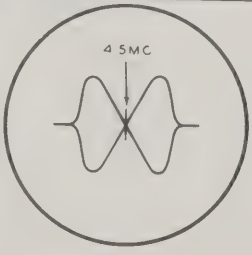


FIG. 3

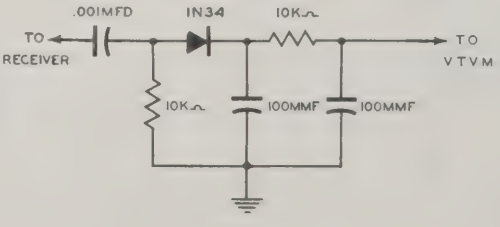
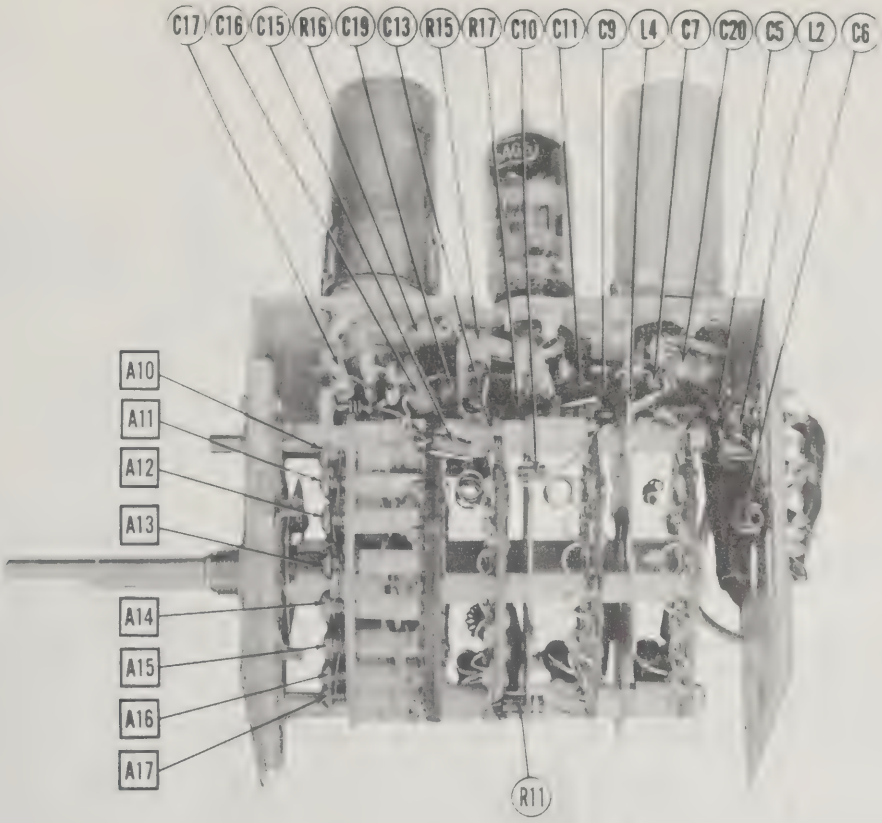
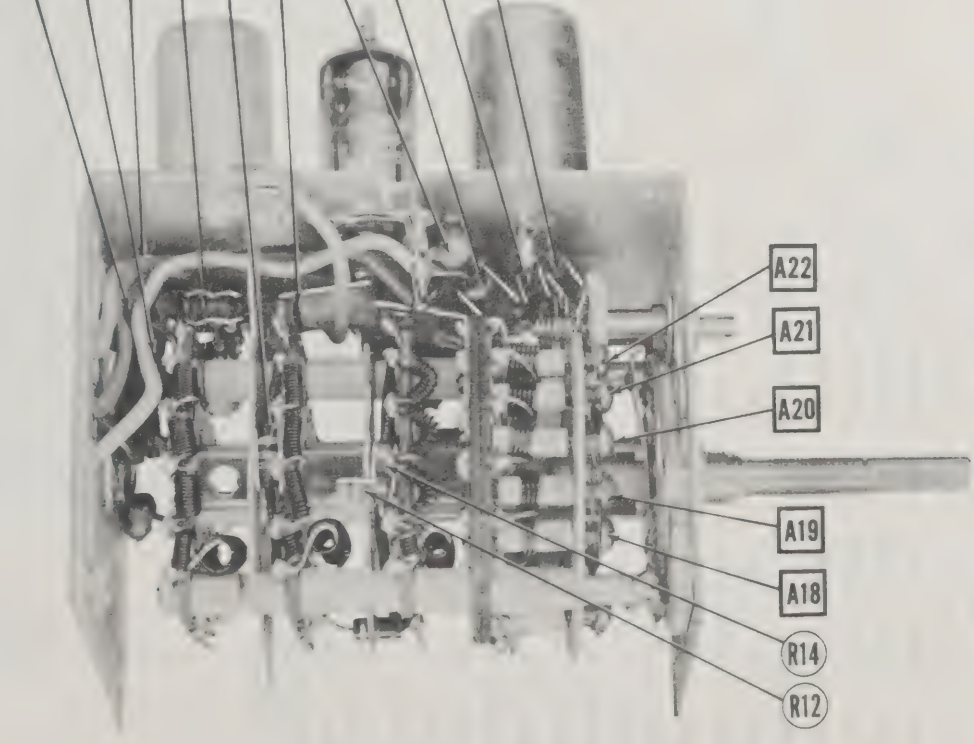


FIG. 4



RF TUNER-RIGHT SIDE



RF TUNER-LEFT SIDE

VOLTAGE AND RESISTANCE MEASUREMENTS

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AG5	-.4VDC	0V.	6.3VAC	0V.	145VDC	135VDC	0V.		
V 2	6AG5	-1.1VDC	0V.	0V.	6.3VAC	155VDC	100VDC	0V.		
V 3	6C4	140VDC	0V.	0V.	6.3VAC	140VDC	§-4.2VDC	3.8VDC		
V 4	6AG5	-.8VDC	.3VDC	0V.	6.3VAC	165VDC	165VDC	.3VDC		
V 5	6AG5	-.8VDC	.3VDC	0V.	6.3VAC	165VDC	165VDC	.3VDC		
V 6	6AG5	0V.	1.4VDC	0V.	6.3VAC	90VDC	155VDC	1.4VDC		
V 7	6AL5	0V.	0V.	0V.	6.3VAC	.1VDC	0V.	-.4VDC		
V 8	6AG7	0V.	0V.	0V.	0V.	18VDC	320VDC	6.3VAC	340VDC	
V 9	6AG5	-.5VDC	0V.	0V.	6.3VAC	35VDC	40VDC	0V.		
V 10	6AL5	-.3VDC	.3VDC	0V.	6.3VAC	.6VDC	0V.	-.6VDC		
V 11	6SL7GT	-.5VDC	85VDC	0V.	-.2VDC	110VDC	.8VDC	6.3VAC	0V.	
V 12	6V6GT	0V.	0V.	300VDC	320VDC	0V.	0V.	6.3VAC	19VDC	
V 13	6SN7GT	0V.	155VDC	7VDC	0V.	15VDC	1.6VDC	6.3VAC	0V.	
V 14	6SN7GT	-17VDC -13VDC	175VDC 100VDC	0V.	6.3V.	400VDC	9VDC 22VDC	6.3VAC	0V.	
V 15	6AL5	0V.	0V.	0V.	6.3VAC	4VDC	0V.	-2VDC		
V 16	6SN7GT	-5VDC -2.7VDC	145VDC	14VDC	.4VDC	310VDC	14VDC	6.3VAC	0V.	
V 17	6BG6G	0V.	0V.	9VDC	0V.	-1.4VDC	0V.	6.3VAC	285VDC	TOP CAP *
V 18	6X5GT	0V.	¶	370VDC	370VDC	370VDC	0V.	¶	440VDC	
V 19	1B3GT	* DO NOT MEASURE.								
V 20	5U4G	0V.	400VDC	440VDC	400VAC	0V.	400VAC	0V.	400VDC	
V 21	Picture Tube	6.3VAC	1.6VDC	PIN 10 320VDC	PIN 11 175VDC	PIN 12 0V.				

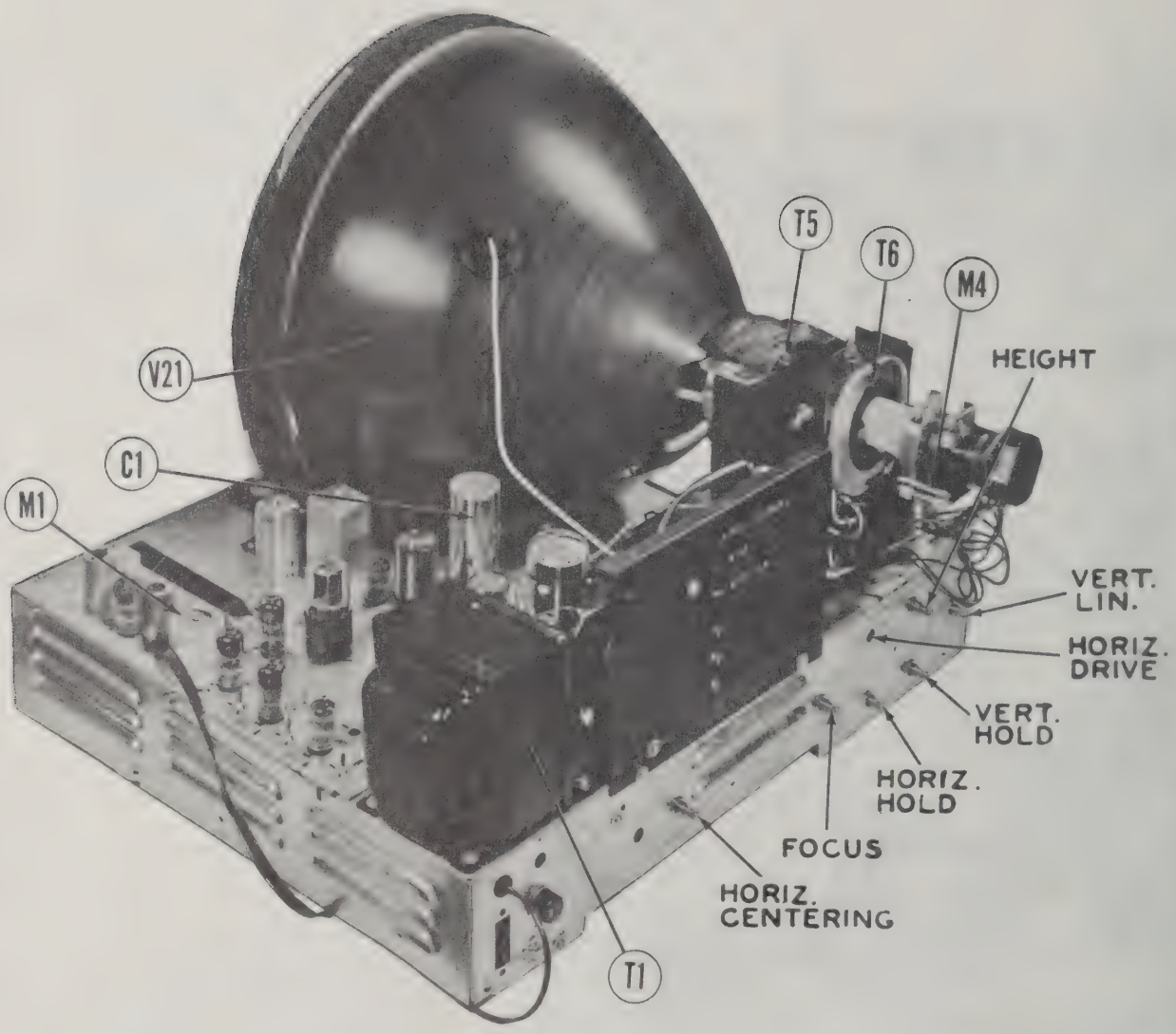
FOCUS CONTROL SET FULLY COUNTERCLOCKWISE.
§ TAKEN WITH VACUUM TUBE VOLTMETER.
¶ 6.3VAC MEASURED ACROSS FILAMENTS.
* DO NOT MEASURE.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AG5	3.7 Meg.	0Ω	.1Ω	0Ω	†13KΩ	†36KΩ	0Ω		
V 2	6AG5	1.1 Meg.	0Ω	0Ω	.1Ω	†3.7KΩ	†85KΩ	0Ω		
V 3	6C4	†9.5KΩ	Inf.	0Ω	.1Ω	†9.5KΩ	22KΩ	470Ω		
V 4	6AG5	3.2 Meg.	47Ω	0Ω	.1Ω	†3.7KΩ	†3.7KΩ	47Ω		
V 5	6AG5	3.2 Meg.	47Ω	0Ω	.1Ω	†3.7KΩ	†3.7KΩ	47Ω		
V 6	6AG5	3.3KΩ	100Ω	0Ω	.1Ω	†11KΩ	†3.7KΩ	100Ω		
V 7	6AL5	0Ω	.2Ω	0Ω	.1Ω	4.7KΩ	0Ω	1 Meg.		
V 8	6AG7	0Ω	0Ω	0Ω	1 Meg.	10KΩ	†48KΩ	.1Ω	†3.5KΩ	
V 9	6AG5	100KΩ	0Ω	0Ω	.1Ω	†30KΩ	†30KΩ	0Ω		
V 10	6AL5	Inf.	Inf.	0Ω	.1Ω	10KΩ	0Ω	10KΩ		
V 11	6SL7GT	3.3 Meg.	†220KΩ	0Ω	60Ω	†220KΩ	1000Ω	.1Ω	0Ω	
V 12	6V6GT	0Ω	0Ω	†1000Ω	†700Ω	470KΩ	Inf.	.1Ω	400Ω	
V 13	6SN7GT	1 Meg.	†13KΩ	4.7KΩ	0Ω	†100KΩ	220KΩ	.1Ω	0Ω	
V 14	6SN7GT	1 Meg. 2 Meg.	#1 Meg. #3 Meg.	0Ω	2.2 Meg.	#6.2KΩ	5.5KΩ 470Ω	.1Ω	0Ω	
V 15	6AL5	9KΩ	9KΩ	0Ω	.1Ω	3.4 Meg.	0Ω	3.4 Meg.		
V 16	6SN7GT	200KΩ 100KΩ	#230KΩ	1.5KΩ	3.8 Meg.	#15KΩ	1.5KΩ	.1Ω	0Ω	
V 17	6BG6G	Inf.	0Ω	68Ω	Inf.	470KΩ	Inf.	.1Ω	#10KΩ	TOP CAP #130Ω
V 18	6X5GT	Inf.	Inf.	†115Ω	†110Ω	†115Ω	Inf.	Inf.	100KΩ	
V 19	1B3GT	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	TOP CAP #340Ω
V 20	5U4G	Inf.	13KΩ	#38Ω	27Ω	Inf.	27Ω	Inf.	13KΩ	
V 21	Picture Tube	.1Ω	220KΩ	PIN 10 †700Ω	PIN 11 8KΩ	PIN 12 0Ω				

FOCUS CONTROL SET FULLY COUNTERCLOCKWISE.
† MEASURED FROM PIN 8 OF V20.
# MEASURED FROM PIN 8 OF V18.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltage measured at 1,000 ohms.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. Front panels controls set at minimum.
6. Where readings may vary according to the setting of the service controls, both minimum and maximum readings are given.



CHASSIS-REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

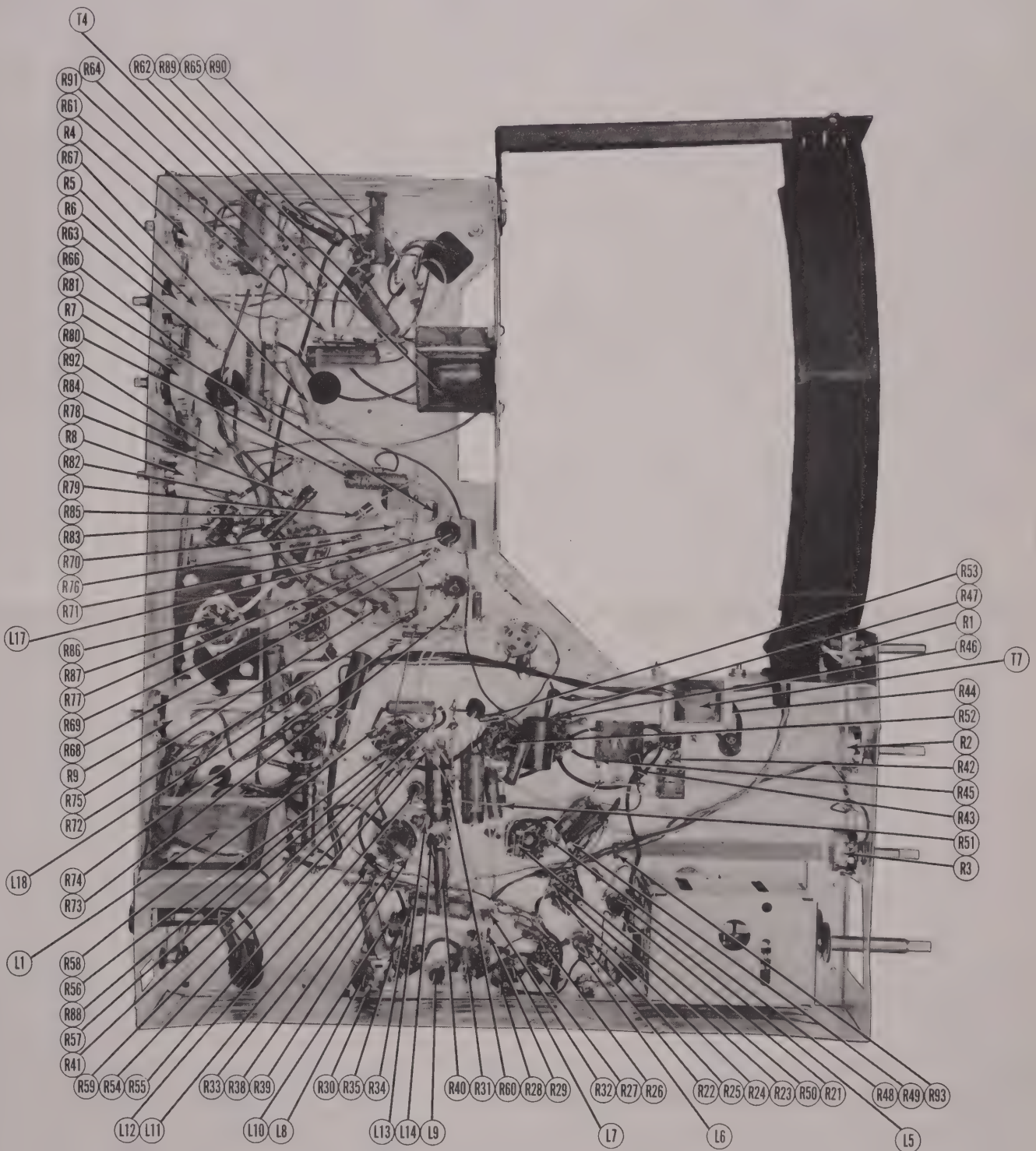
Turn the receiver on and tune in a TV station, preferably a test pattern.

Turn the horizontal hold control to the mid-position of its range and adjust the horizontal frequency slug (B1) until the picture synchronizes horizontally.

Turn the horizontal drive trimmer (B2) clockwise as far as possible without crowding the right half of the picture.

Adjust the horizontal linearity slug (B3) for best linearity from left to right.

A slight readjustment of B2 may be necessary for optimum results.



CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: TRANSVISION PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	NOTES
V1	RF Amp.		6AG5	7BD	
V2	Mixer		6AG5	7BD	
V3	Oscillator		6C4	6Q	
V4A	1st Video IF		6AG5	7BD	
B	1st Video IF		6BC5	7BD	
V5A	2nd Video IF		6AG5	7BD	
B	2nd Video IF		6BC5	7BD	
V6A	3rd Video IF		6AG5	7BD	
B	3rd Video IF		6BC5	7BD	
V7	Video Det. - AGC Rect.		6AL5	6BT	
V8	Video Amp.		6AG7	8Y	
V9A	Sound IF Amp.		6AG5	7BD	
B	Sound IF Amp.		6BC5	7BD	
V10	Ratio Det.		6AL5	6BT	
V11	AF Amp.		6SL7GT	8BD	
V12	Audio Output		6V6GT	7AC	
V13	DC Rest. -Sync. Sep. -Sync Amp.		6SN7GT	8BD	
V14	Vert. Osc. -Vert Amp.		6SN7GT	8BD	
V15	Hor. Phase Det		6AL5	6BT	
V16	Hor. Mult		6SN7GT	8BD	
V17	Hor. Output		6BG6G	5BT	
V18	Damper		6X5GT	6S	
V19	HV Rect.		1B3GT	3C	
V20	LV Rect.		5U4G	5T	
V21	Picture Tube				

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: TRANSVISION PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	30	475	90	AFH862J4A		UPT33250		TVL-3840	▲ Filter
B	30	475				BR202A		TVA-1205	■ Filter
C	10	475							▲ V. Amp. Screen
D	20	25							Output Cath.
C2A	30	475	90	AFH862J4A		UPT33250		TVL-3840	▲ Filter
B	30	475				BR202A		TVA-1205	■ Filter
C	10	475							▲ Filter
D	20	25							Vert. Amp. Cath.
C3A	30	475	90	AFH862J4A		UPT33250		TVL-3840	▲ Filter
B	30	475				BR202A		TVA-1205	■ Filter
C	10	475							▲ Decoupling
D	20	25							Vert. Amp. Cath.
C4	4	50		PRS150/4		BR550		TVA-1303	Stabilizing Cap.
C5	25			SI25	D6-250		GP1K-25	19C27	RF Coupling
C6	680			SI680	D6-681		GP2K-680	19C17	AGC Filter
C7	680			SI680	D6-681		GP2K-680	19C17	RF Screen
C8	680			SI680	D6-681		GP2K-680	19C17	RF Filament
C9	25			SI25	D6-250		GP1K-25	19C27	RF Coupling
C10	.25								RF Coupling
C11	.5				TCZ-.5				RF Coupling
C12	1.5			SI1.5NPO	TCZ-1.5		NPOK-1.5		RF Coupling
C13	15			SI15	D6-150		GP1K-15	19C22	RF Coupling
C14	5000			BPD-005	DD-502		811-005	29C1	Mixer Screen
C15	1.5			SI1.5NPO	TCZ-1.5		NPOK-1.5		Osc. Coupling
C16	680			SI680	D6-681		GP2K-680	19C17	Osc. Feedback
C17	3						N150K-3		Osc. Grid
C18	680			SI680	D6-681		GP2K-680	19C17	RF Bypass
C19	680			SI680	D6-681		GP2K-680	19C17	RF Bypass
C20	680			SI680	D6-681		GP2K-680	19C17	Osc. Fil.
C21	2000			SI2000	D6-202	1W5D2	GP2M-002	29C2	RF Bypass
C22	150			SI150	D6-151	5W5T15	GP2K-150	19C12	IF Coupling
C23	2000			SI2000	D6-202	1W5D2	GP2M-002	29C2	Conv. Plate Dec.
C24	1500			SI1500	D6-152	1W5D15	GP2L-0015	19C20	AGC Filter
C25	.05	600		P688-05	DF-503	PTE68S5		6TM-15	AGC Filter
C26	1500			SI1500	D6-152	1W5D15	GP2L-0015	19C20	1st V. IF Dec. †
C27	150			SI150	D6-151	5W5T5	GP2K-250	19C12	IF Coupling
C28	1500			SI1500	D6-152	1W5D15	GP2L-0015	19C20	2nd V. IF Dec. †
C29	1500			SI1500	D6-152	1W5D15	GP2L-0015	19C20	2nd V. IF Fil.
C30	150			SI150	D6-151	5W5T15	GP2K-150	19C12	IF Coupling
C31	68				TCZ-68	5R5Q7	N750L-68	36C9	Fixed Trimmer
C32	100			SI100	D6-101	5W5T1	GP1K-100	19C11	3rd V. IF Cath.
C33	1500			SI1500	D6-152	1W5D15	GP2L-0015	19C20	3rd V. IF Dec. †
C34	150			SI150	D6-151	5W5T15	GP1K-150	19C12	IF Coupling
C35	150			SI150	D6-151	5W5T15	GP1K-150	19C12	IF Coupling
C36	10			SI10	D6-100	5W5Q1	GP1K-10	19C19	V. Diode Filter
C37	.05	600		P688-05	DF-503	PTE68S5		6TM-15	Video Coupling
C38	50			SI50	D6-500	5W5Q5	GP1K-50	19C28	Fixed Trimmer
C39	.1	600		P688-1	DF-104	PTE6P1		6TM-1	Video Coupling
C40	.1	600		P688-1	DF-104	PTE6P1		6TM-1	Pic. Tube Cath.
C41	1.5			SI1.5NPO	TCZ-1.5		NPOK-1.5		S. IF Coupling
C42	100			SI100	D6-101	5W5T1	GP1K-100	19C11	S. IF Coupling
C43	2000			SI2000	D6-202	1W5D2	GP2M-002	29C2	S. IF Dec. †
C44	2000			SI2000	D6-202	1W5D2	GP2M-002	29C2	Diode Load Cap.
C45	2000			SI2000	D6-202	1W5D2	GP2M-002	29C2	De-emphasis
C46	.01	600		P688-01	D6-103	PTE6S1	811-01	6TM-11	Audio Coupling
C47	.01	600		P688-01	D6-103	PTE6S1	811-01	6TM-11	Audio Coupling
C48	.01	600		P688-01	D6-103	PTE6S1	811-01	6TM-11	Audio Coupling
C49	.0047	600		P688-0047	D6-472	PTE6D5	GP2M-0047	6TM-472	Output Plate
C50	.01	600		P688-01	D6-103	PTE6S1	811-01	6TM-11	Sync. Coupling
C51A	10000			P688-01		PTE6S1	811-01	6TM-11	Vert. Sync. Coup.
B	2000			P688-002	PC-101 *	PTE6D2	GP2M-002	6TM-22	Integrator Net.
C	5000			P688-005		PTE6D5	811-005	6TM-25	Integrator Net.
D	5000			P688-005		PTE6D5	811-005	6TM-25	Integrator Net.
C52	5000	500		1467-005	D6-502	1D5D5	811-005	1FM-25	Vert. Osc. Grid
C53	.1	600		P688-1		PTE6P1		6TM-1	Vert. Discharge

CAPACITORS (CONT.)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: TRANSVISION PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C54	.1	600		P688-1	DF-104	PTE6P1		6TM-1	Vert. Sweep Coupling
C55	.05	600		P688-05	DF-503	PTE68S5		6TM-15	Fixed Trimmer
C56	1000	500		1468-0005	D6-102	1W5D1	GP2L-001	1FM-21	Hor. Sync. Coupling
C57	1000	500		1468-0005	D6-102	1W5D1	GP2L-001	1FM-21	Hor. Sync. Coupling
C58	1500			SI1500	D6-152	1W5D15	GP2L-0015	19C20	Voltage Divider †
C59	1500			SI1500	D6-152	1W5D15	GP2L-0015	19C20	Integrator Net. †
C60	.047	600		P688-047	DF-503	PTE68S5		6TM-473	Hor. Feedback
C61	.0047	600		P688-0047	D6-472	PTE6D5	GP2M-0047	6TM-472	AFC Filter
C62	.1	600		P688-1	DF-104	PTE6P1		6TM-1	AFC Filter
C63	200	500		1468-002	D6-201	5W5T2	GP2K-200	1FM-32	Hor. MV Feedback
C64	5000	500		1467-005	D6-502	1D5D5	811-005	1FM-25	Fixed Trimmer
C65	.05	600		P688-05	DF-503	PTE68S5		6TM-15	Hor. MV Decoup.
C66	510	500		1468-0005	D6-501	5W5T5	GP2K-510	1FM-35	Hor. Discharge
C67	510	500		1468-0005	D6-501	5W5T5	GP2K-510	1FM-35	Hor. Sweep Coupling
C68	.05	600		P688-05	DF-503	PTE68S5		6TM-15	Hor. Output Screen
C69	.1	600		P688-1	DF-104	PTE6P1		6TM-1	Hor. Output Cath.
C70	.03	600		P688-03		PTE6S3		6TM-13	Damper Filter
C71	.047	600		P688-047		PTE6S5		6TM-473	Damper Filter
C72	500	10000		HV10C	TV3-501				HV Filter

* Items C51A, C51B, C51C, C51D, R61A, R61B, R61C, and R61D are combined into one unit.
† Some models use 2000MMF in this application.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: TRANSVISION PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	INSTALLATION NOTES
R1A	1 Meg.	½	28	Q13-137	AM-63-Z	B-70-S	Volume control
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Attach to R1A per instructions
C	Switch		Not Req.	76-1	SW-A	Not Req.	Attach to R1A per instructions
R2A	10KΩ	½	32	Q14-116	AM-30-V		Contrast control
B	Shaft		Not Req.	Not Req.	FS-3		Attach to R2A per instructions
R3A	100KΩ	½	30	Q11-128	AM-49-8	B-40	Brightness control
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Attach to R3A per instructions
R4A	5000Ω	½	373	Q11-114	AM-19-S	AN-10	Vert. linearity control
B	Shaft		Not Req.	Not Req.	FKS-1/4	AK-1	Attach to R4A per instructions
R5A	2 Meg.	½	37	Q11-139	AG-83-S	AN-75	Height control
B	Shaft		Not Req.	Not Req.	FKS-1/4	AK-1	Attach to R5A per instructions
R6A	1 Meg.	½	374	Q11-137	AM-61-S	AN-69	Vert. hold control
B	Shaft		Not Req.	Not Req.	FKS-1/4	AK-1	Attach to R6A per instructions
R7A	100KΩ	½	36	Q11-136	AM-49-S	AN-40	Horiz. hold control
B	Shaft		Not Req.	Not Req.	FKS-1/4	AK-1	Attach to R7A per instructions
R8	2000Ω	2	326	W-2000	43-2000	VK-131	Focus control-Wire Wound
R9	25Ω	2	644	W-25	43-25	VK-111	Horiz. centering control-Wire Wound

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: TRANSVISION PART No.	IRC PART No.	IDENTIFICATION CODES (ALL RESISTORS ARE ± 10% UNLESS OTHERWISE STATED)
R10	1000Ω 20%	½		BTS-1000	RF Amp. Grid
R11	33KΩ 20%	½			RF Amp. Screen
R12	10KΩ	1		BTA-10K	RF Amp. Plate
R13	18KΩ	½		BTS-18K	RF Coil Shunt
R14	4700Ω	½		BTS-4700	RF Coil Shunt
R15	82KΩ 20%	½			Conv. Grid
R16	1 Meg. 20%	½		BTS-1 Meg.	Conv. Grid
R17	82KΩ	½		BTS-82K	Conv. Screen
R18	6800Ω 20%	1			Osc. Plate
R19	22KΩ 20%	½		BTS-22K	Osc. Grid
R20	470Ω 20%	½		BTS-470	Osc. Cathode
R21	1000Ω	½		BTS-1000	Conv. Plate
R22	470KΩ	½		BTS-470K	AGC Network
R23	4700Ω	½		BTS-4700	1st Video IF Amp. Grid
R24	47Ω	½			1st Video IF Amp. Cathode
R25	1000Ω	½		BTS-1000	1st Video IF Amp. Decoupling
R26	10KΩ 20%	½			2nd Video IF Amp. Grid
R27	47Ω 20%	½			2nd Video IF Amp. Cathode
R28	1000Ω	½		BTS-1000	2nd Video IF Amp. Decoupling
R29	3300Ω	½		BTS-3300	3rd Video IF Amp. Grid
R30	100Ω	½		BTS-100	3rd Video IF Amp. Cathode
R31	6800Ω	1		BTA-6800	3rd Video IF Amp. Plate
R32	1000Ω	½		BTS-1000	3rd Video IF Amp. Decoupling
R33	4700Ω	½		BTS-4700	Video Det. Diode Load
R34	2.2 Meg. 5%	½		BTS-2.2 Meg. - 5%	AGC Network
R35	1 Meg. 20%	½		BTS-1 Meg.	AGC Rect. Diode Load
R36	1000Ω	½		BTS-1000	Voltage Divider-See Note 1
R37	220KΩ	½		BTS-220K	Voltage Divider-See Note 1
R38	1 Meg.	½		BTS-1 Meg.	Video Amp. Grid
R39	47KΩ	1		BTA-47K	Video Amp. Screen
R40	3300Ω	2		BTB-3300	Video Amp. Plate
R41	2200Ω	½		BTS-2200	Picture Tube Grid
R42	100KΩ	½			Sound IF Grid
R43	47KΩ	1			Sound IF Decoupling
R44	47KΩ	1		BTA-47K	Bleeder
R45	22KΩ	½		BTS-22K	De-emphasis
R46	10KΩ 20%	½		BTS-10K	Ratio Det. Diode Load
R47	10KΩ 20%	½		BTS-10K	Ratio Det. Diode Load
R48	3.3 Meg.	½		BTS-3.3 Meg.	AF Amp. Grid
R49	220KΩ	½		BTS-220K	AF Amp. Plate
R50	1000Ω	½		BTS-1000	AF Amp. Cathode
R51	220KΩ	½		BTS-220K	AF Amp. Plate
R52	470KΩ	½		BTS-470K	Audio Output Grid
R53	390Ω 5%	½		BTS-390-5%	Audio Output Cathode
R54	220KΩ	½		BTS-220K	Sync. Amp. Cathode
R55	1 Meg.	½		BTS-1 Meg.	Sync. Amp. Plate
R56	100KΩ	½		BTS-100K	Voltage Divider
R57	1 Meg.	½		BTS-1 Meg.	Sync. Sep. Grid
R58	4700Ω	½		BTS-4700	Sync. Sep. Cathode
R59	4700Ω	½		BTS-4700	Sync. Sep. Plate
R60	4700Ω	½		BTS-4700	Sync. Sep. Plate

RESISTORS (CONT.)

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: TRANSVISION PART No.	IRC PART No.	IDENTIFICATION CODES
R61A	22KΩ	½	†		Voltage Divider
B	22KΩ	½			Integrator
C	8200Ω	½			Integrator
D	8200Ω	½			Integrator
R62	1 Meg.	½		BTS-1 Meg.	Vert. Osc. Grid
R63	1 Meg.	½		BTS-1 Meg.	Vert. Osc. Plate
R64	4700Ω	½		BTS-4700	Vert. Peaking
R65	2.2 Meg.	½		BTS-2.2 Meg.	Vert. Amp. Grid
R66	470Ω	½		BTS-470	Vert. Amp. Cathode
R67	5000Ω	10		1 3/4A-5000	Decoupling-Wire Wound
R68	100KΩ	½		BTS-100K	Horiz. AFC Diode Load
R69	100KΩ	½		BTS-100K	Horiz. AFC Diode Load
R70	3.3 Meg.	½		BTS-3.3 Meg.	Horiz. AFC Diode Load
R71	470KΩ	½		BTS-470K	Horiz. AFC Filter Network
R72	22KΩ	½		BTS-22K	Horiz. AFC Diode Load
R73	4700Ω	½		BTS-4700	Horiz. Feedback
R74	4700Ω	½		BTS-4700	Horiz. Feedback
R75	2200Ω	½		BTS-2200	Horiz. Feedback
R76	1500Ω	½		BTS-1500	Horiz. Mult. Cathode
R77	5100Ω	½		BTS-4700	Horiz. Mult. Plate
R78	100KΩ	½		BTS-100K	Horiz. Mult. Grid
R79	220KΩ	1		BTA-220K	Horiz. Mult. Plate
R80	10KΩ 20%	½		BTS-10K	Horiz. Mult. Decoupling
R81	4700Ω	½		BTS-4700	Horiz. Peaking
R82	100Ω	½			Parasitic Suppressor
R83	470KΩ	½		BTS-470K	Horiz. Output Grid
R84	68Ω	1		BW-1-68	Horiz. Output Cathode-Wire Wound
R85	10KΩ	10		1 3/4A-10K	Horiz. Output Screen-Wire Wound
R86	3.3Ω	1			HV Rect. Filament
R87	470KΩ	½			HV Filter
R88	10KΩ	10		1 3/4A-10K	Bleeder-Wire Wound
R89	1000Ω	10		1 3/4A-1000	Filter-Wire Wound
R90	1000Ω	10		1 3/4A-1000	Filter-Wire Wound
R91	250Ω	20		2D-250	Filter-Wire Wound
R92	510Ω	2		BTB-470	Focus Coil Shunt
R93	150Ω	½		BTS-150	Decoupling

† Items R61A, R61B, R61C, R61D, C51A, C51B, C51C, and C51D are combined into one unit. See C51 for part listing.
Note 1. Not used in all models.

TRANSFORMER (POWER)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: TRANSVISION PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.
T1	117VAC @ 2.3A	750VCT .280ADC	5VAC @ 3A	6.3VAC @ .6A SEC. 4 6.3VAC @ 7.6A	303	P-6315 ① P-6134 ②	P-3169	TP-405 ③

① Mount with universal mounting brackets.
② Use for SEC. #3.
③ Drill new mounting holes.

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING: DC RESISTANCE PRI.	RATING: DC RESISTANCE SEC.	REPLACEMENT DATA: TRANSVISION PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	NOTES
T2	168Ω	1500Ω	306	A-8121	A-4000	TBC-3	Vert. Block Osc. Trans.
T3	300Ω Tap @ 92Ω	7Ω Tap @ .6Ω SEC. 2 0Ω	308	A-8127	HVO-3	TFB-3	Hor. Output Trans.
T4	1200Ω Tap @	1Ω	305	A-8123	A-3037		Vert. Output Trans.
T5A	14Ω		310	DY-7	MD-3		Hor. Deflection Coil
B	64Ω						Vert. Deflection Coil
T6	375Ω		309	FC-10	MF-3		Focus Coil

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: Transvision PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	INSTALLATION NOTES
T7	4500Ω	3.7Ω	300Ω	.6Ω	21	A-3877	A-2930	RO-8	

SPEAKER

ITEM No.	RATINGS: FIELD RES.	RATINGS: V. C. IMP.	REPLACEMENT DATA: TRANSVISION PART No.	JENSEN PART No.	QUAM PART No.	NOTES
SP1	PM	3.7Ω		ST-812 MOD. P69-S	69A2	
	CONE DIA.	V. C. DIA.				
SP2	6 x 9	9/16"				

PARTS LIST CONTINUED ON PAGE 15

PARTS LIST AND DESCRIPTIONS (Continued)

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA				INSTALLATION NOTES
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 ~)	TRANSVISION PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
L1	.280ADC	100Ω	7 Henries	304	C-2326	C-2996	TR-3300	

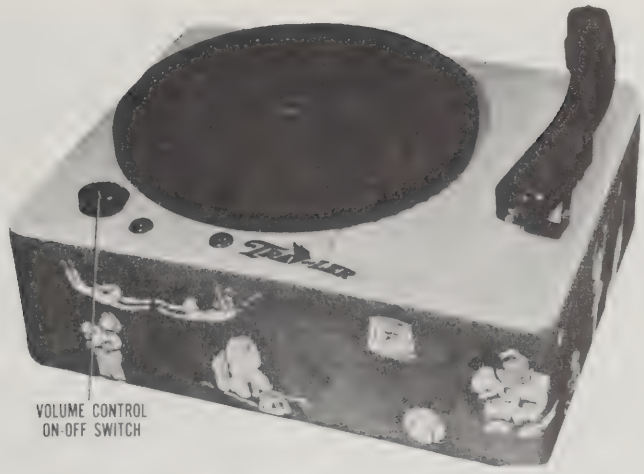
COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA		NOTES
		PRI.	SEC.	TRANSVISION PART No.	MEISSNER PART No.	
L2	Ant. Coil	.2Ω	.1Ω			
L3	Fil. Choke	.1Ω				
L4	Fil. Choke	.1Ω				
L5	1st Video IF	.2Ω				
L6	2nd Video IF	.2Ω				
L7	3rd Video IF	.2Ω				
L8	Sound Trap	.1Ω	.1Ω			
L9	4th Video IF	.2Ω				
L10	RF Choke	8Ω				250 microhenries, green identification dot
L11	Peaking	5Ω			19-1921	125 microhenries
L12	4.5MC Trap	.8Ω				
L13	Peaking	6.8Ω			19-1922 *	Wound on 22KΩ, 200 microhenries
L14	Peaking	5Ω			19-1921	125 microhenries
L15	Sound IF	5.7Ω				Tap at 1.6Ω
L16	Ratio Det. Trans.	6.2Ω	.6Ω			
L17	Horiz. Freq.	49Ω				
L18	Horiz. Lin.	38Ω				

* Parallel with 22KΩ resistor.

MISCELLANEOUS

ITEM No.	PART NAME	TRANSVISION PART No.	NOTES
M1	RF Tuner		
M2	Fuse		3A 250V Type 3AG
M3	Fuse		.25A 250V Type GJV
M4	Ion Trap		

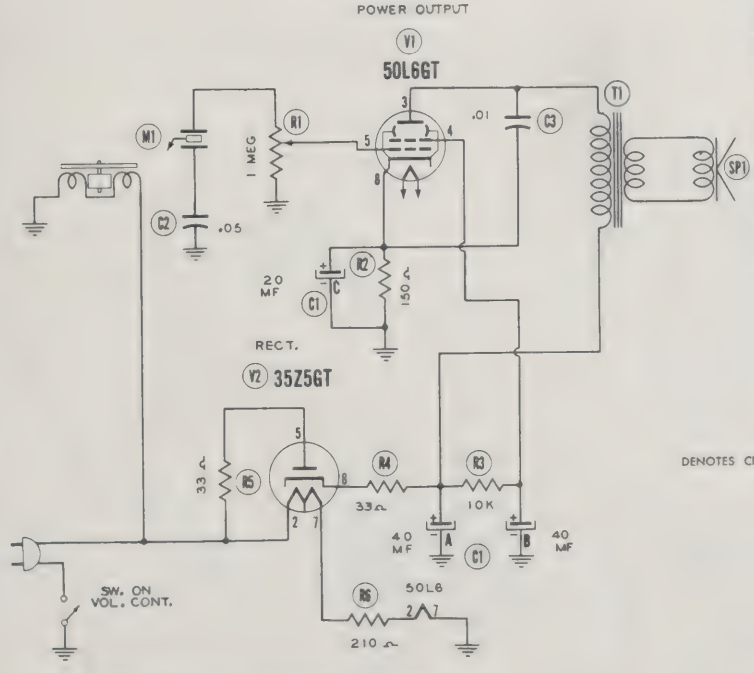


TRAV-LER
MODEL 7036

TRAV-LER
MODEL 7036

TRAV-LER MODEL 7036

TRADE NAME	Trav-Ler Model 7036
MANUFACTURER	Trav-Ler Radio and Television Corp., 571 W. Jackson, Chicago, Illinois
TYPE SET	AC Operated Phono Player with Two Tube Amplifier
TUBES (TWO)	Types 50L6GT Power Output, 35Z5GT Rectifier
POWER SUPPLY	110-120 Volts AC
RATING	.22 Amp. at 117 Volts AC



Pin No.	50L6GT Volt.	50L6GT Res.	35Z5GT Volt.	35Z5GT Res.
1	0V.	Inf.	0V.	Inf.
2	50VAC	50Ω	117VAC	295Ω
3	115VDC	†233Ω	105VAC	270Ω
4	85VDC	†10KΩ	0V.	Inf.
5	0V.	200Ω	112VAC	320Ω
6	0V.	Inf.	0V.	Inf.
7	0V.	0Ω	80VAC	260Ω
8	6.5VDC	150Ω	120VDC	55KΩ

† MEASURED FROM PIN 8 OF V2.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA		RMA BASE TYPE	INSTALLATION NOTES
		TRAV-LER PART No.	STANDARD REPLACEMENT		
V1	Power Output	TU-2	50L6GT	7AC	
V2	Rectifier	TU-2	35Z5GT	6AD	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						IDENTIFICATION CODES AND INSTALLATION NOTES
	CAP.	VOLT	TRAV-LER PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	
C1A	40	150	EC-14	PRS150/40-40-40		EDL44215		TVA-3451	Filter-Red
B	40	150							Filter-Blue
C	20	150							Output Cath. -Yellow
C2	.05	400	PC-5	P488-05	DF-503	PTE4S5		4TM-S5	Phono Isolation
C3	.01	400	PC-7	P488-01	D6-103	PTE4S1	811-01	4TM-S1	Output Plate Byp.
C4	.05	400	PC-5	P488-05	DF-503	PTE4S5		4TM-S5	Line Isolation

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA				INSTALLATION NOTES
	RESISTANCE	WATTS	TRAV-LER PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	
R1A	1 Meg.	½	VC-9	Q13-137	AG-63-Z	BSK-70-S	Volume control
B	Shaft		Not Req.	Not Req.	KSS-3	Not Req.	Attach to R1A per instructions
C	Switch		Not Req.	76-1	SWB	Not Req.	Attach to R1A per instructions

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		IDENTIFICATION CODES
	RESISTANCE	WATTS	TRAV-LER PART No.	IRC PART No.	
R2	150Ω	½	1R-14	BTS-150	Output Cathode
R3	10KΩ	½	1R-37	BTS-10K	Filter
R4	33Ω	½	1R-17		Surge Limiter
R5	33Ω	½	1R-17		Rect. Ballast
R6	210Ω	5	WR-1		Filament Dropping-Wire Wound

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		TRAV-LER PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
	PRI.	SEC.	PRI.	SEC.					
T1	3500Ω	3.5Ω	200Ω	.6Ω	Part of SP1		A-3025		

SPEAKER

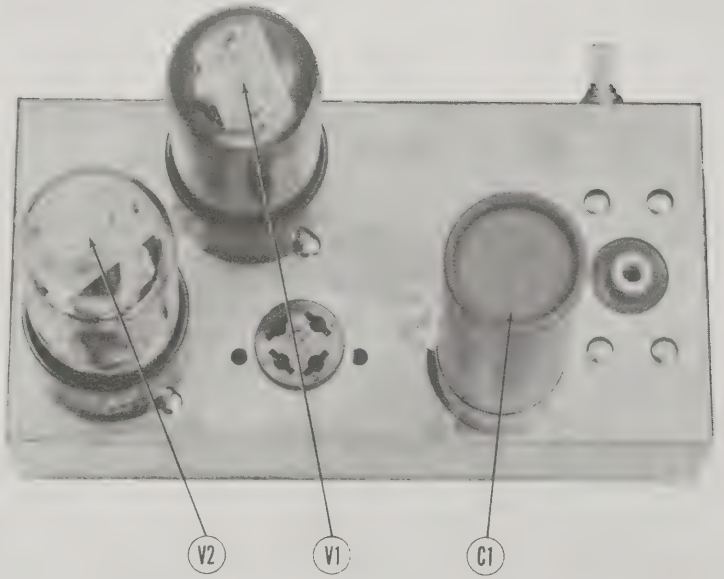
ITEM No.	RATINGS		REPLACEMENT DATA			INSTALLATION NOTES
			TRAV-LER PART No.	JENSEN PART No.	QUAM PART No.	
SP1	FIELD	V. C. IMP.	SPK-14X	ST-113 ① MOD. P4-X	4A07 ①	① Remount output transformer.
	PM	3.5Ω				
SP2	CONE DIA.	V. C. DIA.				
	4"	9/16"				

PHONO CARTRIDGE and NEEDLE

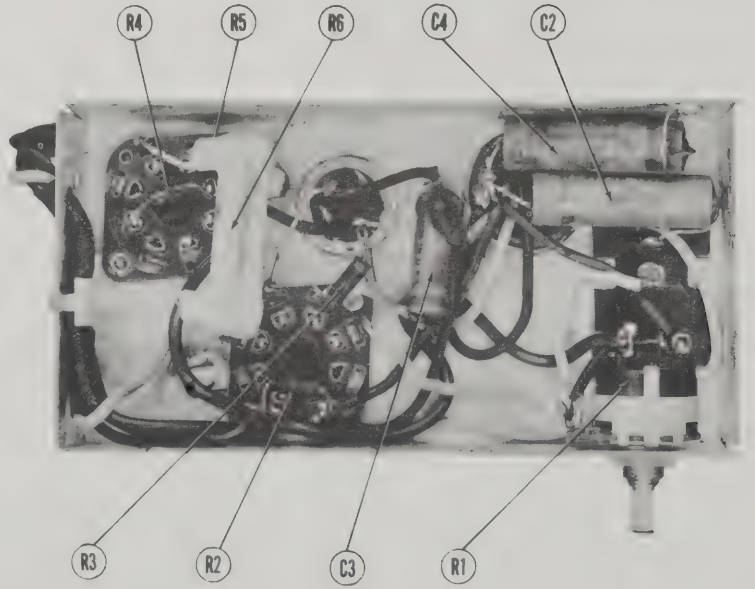
ITEM No.	REPLACEMENT DATA					REMARKS
	TRAV-LER PART No.	ASTATIC PART No.		SHURE PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M1	PU-9	L-82	Optional	W56A	Optional	

ASTATIC AND SHURE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED.

CHASSIS—TOP VIEW



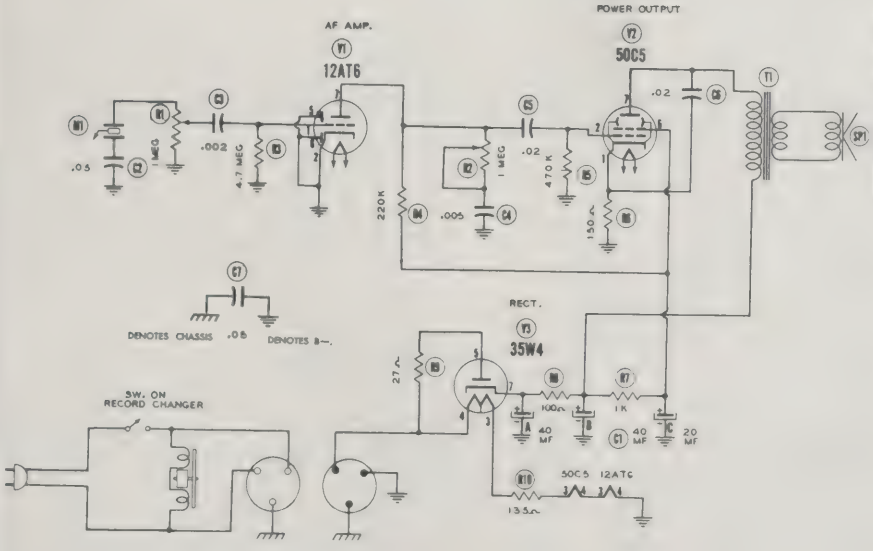
CHASSIS—BOTTOM VIEW



WEBSTER-CHICAGO MODEL 760

TRADE NAME	Webster-Chicago, Model 760
MANUFACTURER	Webster-Chicago, 5610 Bloomington Ave., Chicago 39, Illinois
TYPE SET	AC Operated Automatic Record Player with Three Tube Amplifier
TUBES(THREE)	Types 12AT6 AF Amp., 50C5 Power Output, 35W4 Rectifier

POWER SUPPLY 110-120 Volts AC RATING .25 Amp. at 117 Volts AC
RECORD CHANGER -- WEBSTER-CHICAGO MODEL 77-1



Pin No.	12AT6 Volt.	12AT6 Res.	50C5 Volt.	50C5 Res.
1	-.8VDC	4.7 Meg.	7.6VDC	150Ω
2	0V.	0Ω	0V.	470KΩ
3	13VAC	1Ω	62VAC	70Ω
4	0V.	0Ω	13VAC	1Ω
5	0V.	0Ω	0V.	470KΩ
6	0V.	0Ω	110VDC	†1.1KΩ
7	55VDC	†220KΩ	105VDC	†280Ω

Pin No.	35W4 Volt.	35W4 Res.
1	115VDC	†100Ω
2	110VDC	†1.1KΩ
3	80VDC	205Ω
4	117VAC	340Ω
5	110VAC	270Ω
6	105VAC	215Ω
7	120VDC	80KΩ

† MEASURED FROM PIN 7 OF V3.

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1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: WEB.-CHI. PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	AF Amp.	12AT6	12AT6	7BT	
V2	Power Output	50C5	50C5	7CV	
V3	Rectifier	35W4	35W4	5BQ	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: WEB.-CHI. PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	40	150		PRS150/40-40-40		EDL44215		TVA-3448	Filter-Red
B	40	150							Filter-Red
C	20	150							Filter-Blue
C2	.05	400		P488-05	DF-503	PTE4S5		4TM-S5	Phono Isolation
C3	.002	600		P688-002	D6-202	PTE6D2	GP2M-002	6TM-D2	Audio Coupling
C4	.005	600		P688-005	D6-502	PTE6D5	811-005	6TM-D5	Tone Comp.
C5	.05	400		P488-05	DF-503	PTE4S5		4TM-S5	Audio Coupling
C6	.02	400		P488-02	DF-203	PTE4S2		4TM-S2	Output Plate Byp.
C7	.05	400		P488-05	DF-503	PTE4S5		4TM-S5	Line Isolation

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: WEB.-CHI. PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	INSTALLATION NOTES
R1	1 Meg.	½					Volume control
R2	1 Meg.	½					Tone control

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: WEB.-CHI. PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES
R3	4.7 Meg.	½		BTS-4.7 Meg.	AF Amp. Grid
R4	220KΩ	½		BTS-220K	AF Amp. Plate
R5	470KΩ	½		BTS-470K	Output Grid
R6	150Ω	½		BTS-150	Output Cathode
R7	1000Ω	½		BTS-1000	Filter
R8	100Ω	½		BTS-100	Filter
R9	27Ω	½			Rect. Ballast
R10	135Ω	6			Filament Dropping-Wire Wound

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: WEB.-CHI. PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	INSTALLATION NOTES
T1	2300Ω	4.3Ω	180Ω	.7Ω	67P014	A-3332	A-3025	RO-2 ①	① Drill one new mounting hole.

SPEAKER

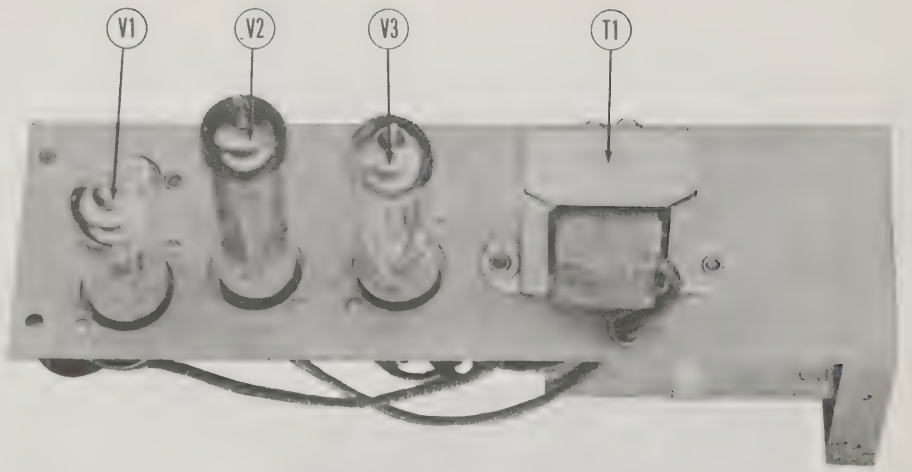
ITEM No.	RATINGS		REPLACEMENT DATA: WEB.-CHI. PART No.	VIKING PART No.	QUAM PART No.	INSTALLATION NOTES
	FIELD	V. C. IMP.				
SP1	PM	4.3Ω	76P019	46J6	46A07	
	CONE DIA.	V. C. DIA.				
SP2	4" x 6"	9/16"				

PHONO CARTRIDGE and NEEDLE

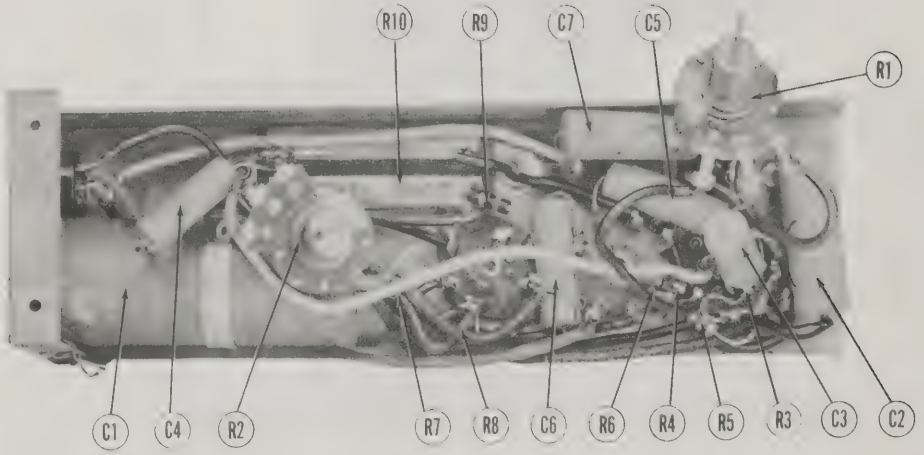
ITEM No.	REPLACEMENT DATA: WEB.-CHI. PART No.	ASTATIC PART No.: CARTRIDGE	ASTATIC PART No.: NEEDLE	SHURE PART No.: CARTRIDGE	SHURE PART No.: NEEDLE	REMARKS
M1		GC-M	"G"			

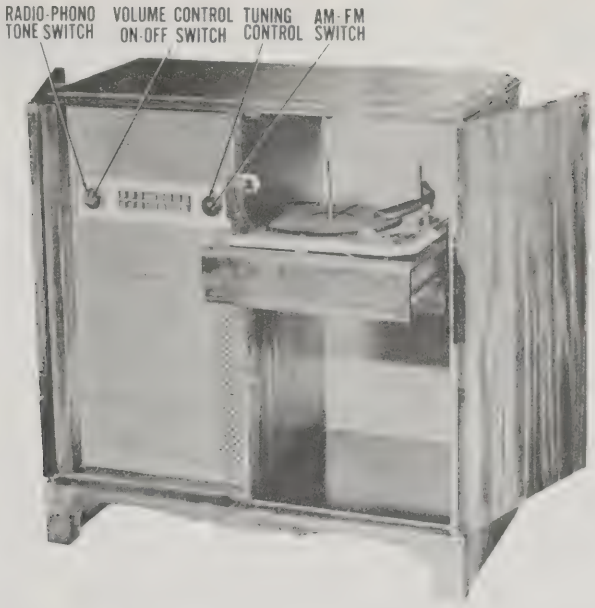
ASTATIC AND SHURE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED.

CHASSIS—TOP VIEW



CHASSIS—BOTTOM VIEW

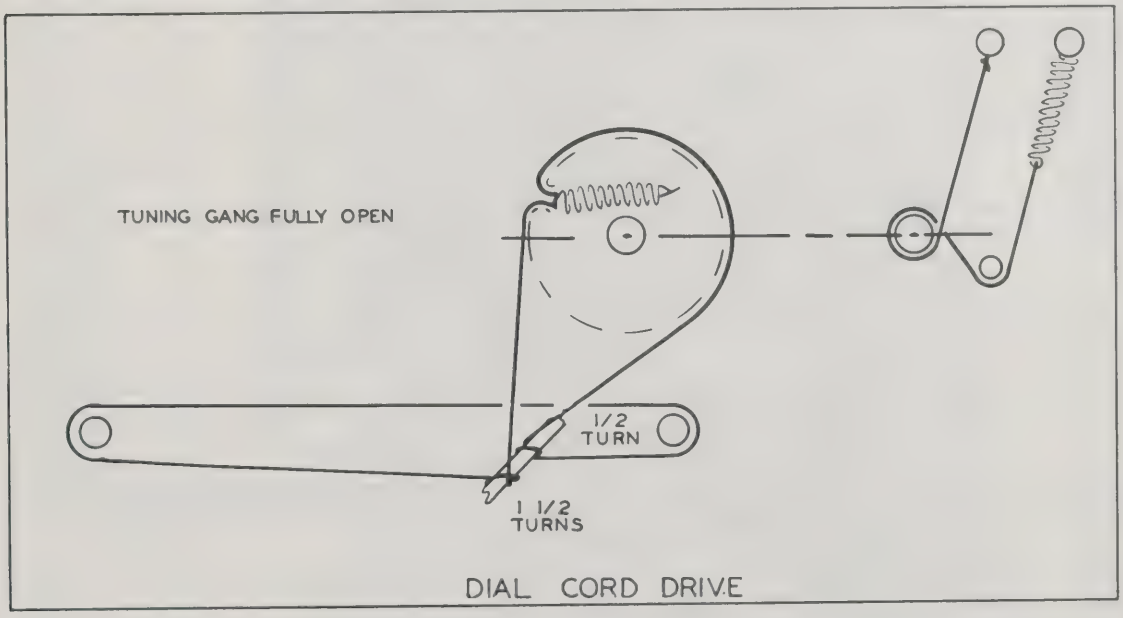




WESTINGHOUSE MODEL H-316C7

TRADE NAME	Westinghouse, Model H-316C7 (Ch. V-2136-1)		
MANUFACTURER	Westinghouse Electric Corp., Home Radio Div., Sunbury, Pa.		
TYPE SET	AC Operated Combination Phono-Radio AM-FM Superheterodyne Receiver		
TUBES (SEVEN)	Types 12AT7 FM RF Amp.-Mixer, 12BE6 FM Osc.-AM Conv., 12BA6 1st FM-AM IF Amp., 6BJ6 2nd FM IF Amp., 12AL5 Ratio Det., 12AV6 DET-AVC-AF, 50L6GT Power Output		
POWER SUPPLY	110-120 Volts AC	RATING	.51 Amp. at 117 Volts AC
TUNING RANGE-BROADCAST	540-1615KC	FREQ. MOD.	88-108MC

FOR SERVICE INFORMATION ON RECORD CHANGER SEE WESTINGHOUSE MODEL V-9481 SIMILAR TO MISCELLANEOUS SERIES 700F 33/45 IN PHOTOFACT SET #75 FOLDER #11



DIAL CORD DRIVE

WESTINGHOUSE
MODEL H-316C7 (Ch. V-2136-1)

WESTINGHOUSE
MODEL H-316C7 (Ch. V-2136-1)

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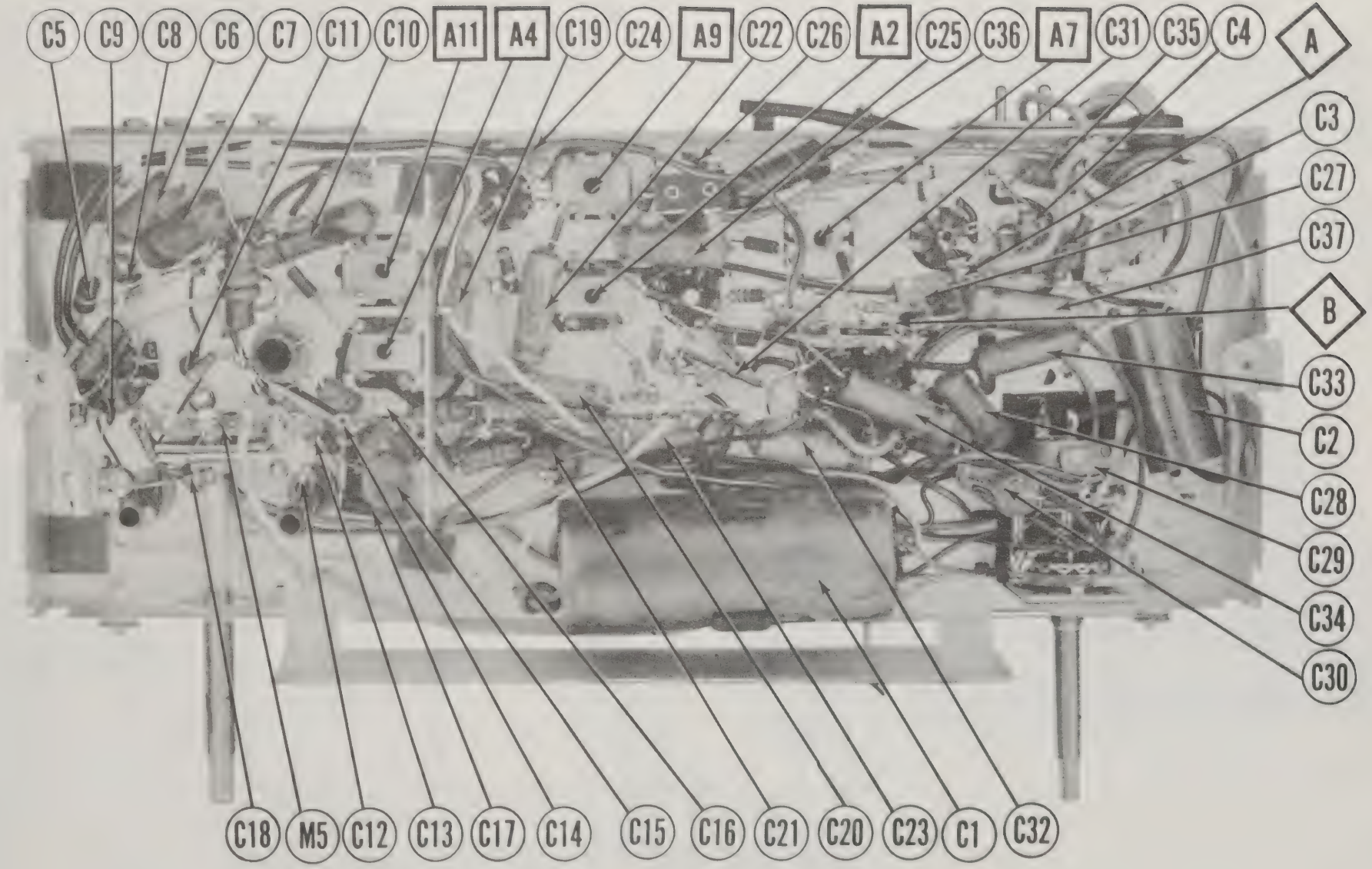
C5
C9
C8
C6
C7
C11
C10
A11
A4
C19
C24
A9
C22
C26
A2
C25
C36
A7
C31
C35
C4
A
C3
C27
C37
B
C33
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C28
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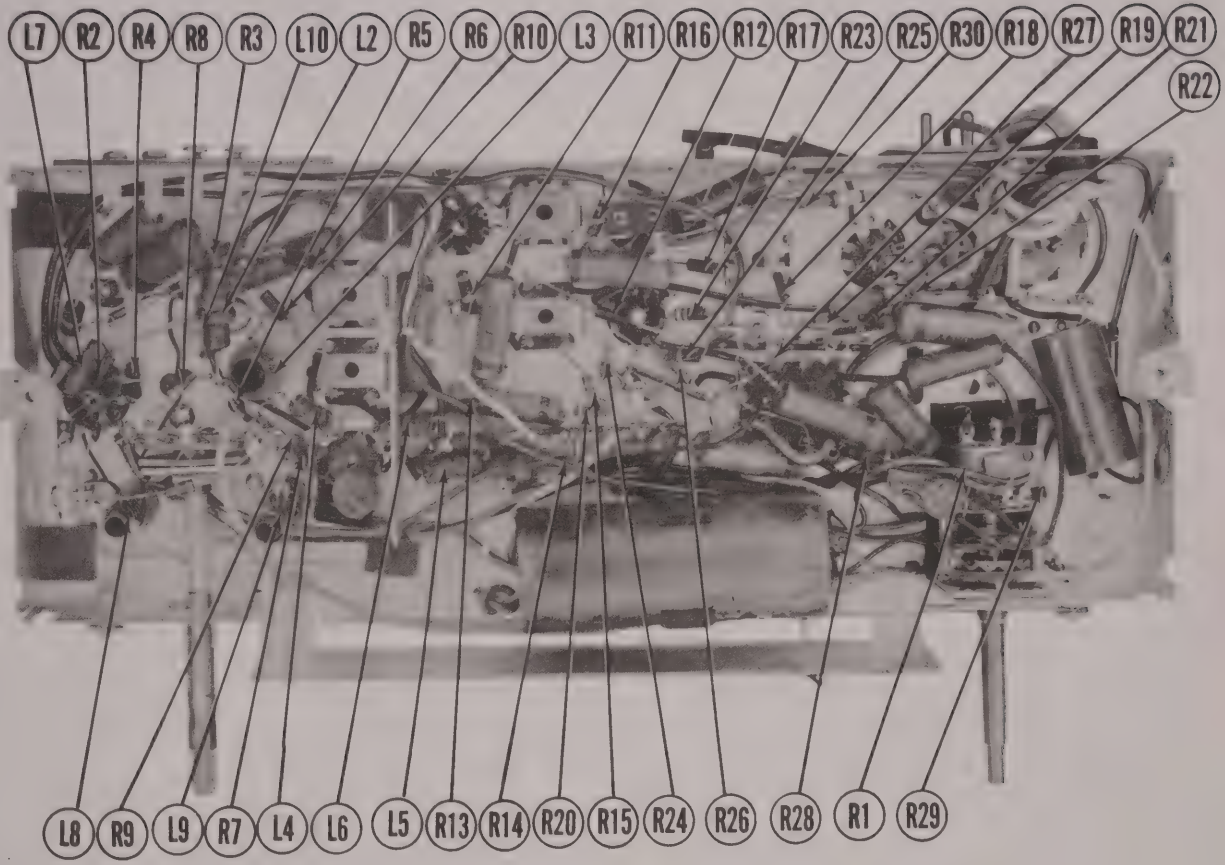

L7
R2
R4
R8
R3
L10
L2
R5
R6
R10
L3
R11
R16
R12
R17
R23
R25
R30
R18
R27
R19
R21
R22
L8
R9
L9
R7
L4
L6
L5
R13
R14
R20
R15
R24
R26
R28
R1
R29

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

To set pointer, turn tuning cap fully closed and set pointer to last reference mark at low frequency end of dial.
Use isolation transformer if available. If not connect a .1MFD capacitor in series with low side of signal generator and chassis.

AM ALIGNMENT

Turn the RADIO-PHONO-TONE switch to Radio position (fully counter-clockwise).
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to pin 7 (Grid) of 12BE6 (V2). Low side to chassis.	455KC (400 ∿ Mod.)	AM (CW)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.	.1MFD	"	1615KC	"	"	"	A5	"
3.		Loop	1400KC	"	Tune for maximum out put	"	A6	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect two matched 100KΩ (± 1%) resistors in series from Point Ⓐ to chassis. The junction of these two resistors is alignment Point Ⓒ as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
4.	.1MFD	High side to pin 7 (Grid) of 12AT7 (V1). Low side to chassis.	10.7MC (Unmod.)	FM (CCW)	Tuning gang fully open	DC Probe to Point Ⓐ. Common to chassis.	A7, A8, A9, A10, A11	Adjust for maximum deflection.
5.	.1MFD	"	"	"	"	DC Probe to Point Ⓑ. Common to Point Ⓒ.	A12	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60 ∿ modulation and 450KC sweep. Use 120 ∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
4.	.1MFD	High side to pin 7 (Grid) of 12AT7 (V1). Low side to chassis.	10.7MC (450KC SWP)	FM (CCW)	Tuning gang fully open	Vert. Amp. to Point Ⓐ. Low side to chassis.	A7, A8, A9, A10, A11	Disconnect stabilizer capacitor C3. Adjust for maximum amplitude and symmetry as per fig. 1.
5.	.1MFD	"	"	"	"	Vert. Amp. to Point Ⓑ. Low side to chassis.	A12	Reconnect capacitor C3. Adjust A12 to place 10.7MC at center of crossover lines as per fig. 2. SLIGHTLY retouch A7 for maximum amplitude and straightness of crossover lines.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
6.	300Ω carbon res.	High side thru 300Ω to terminal "1" of antenna terminal board. Low side to terminal "2".	98MC	FM (CCW)	Set dial to 98MC	DC Probe to Point Ⓐ. Common to chassis.	A13, A14	Adjust for maximum deflection.
7.	"	"	105MC	"	Tune for max. deflection.	"	A15	"
8.	"	"	90MC	"	"	"	A14	Adjust for maximum deflection while rocking tuning gang. Repeat steps 7 and 8 until no further improvement can be made.

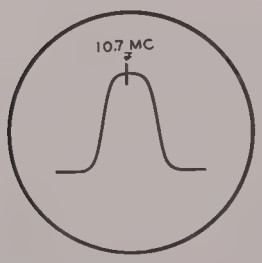


FIG. 1

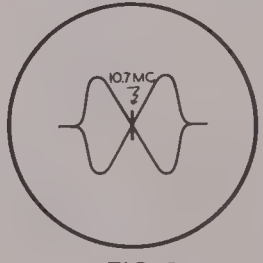
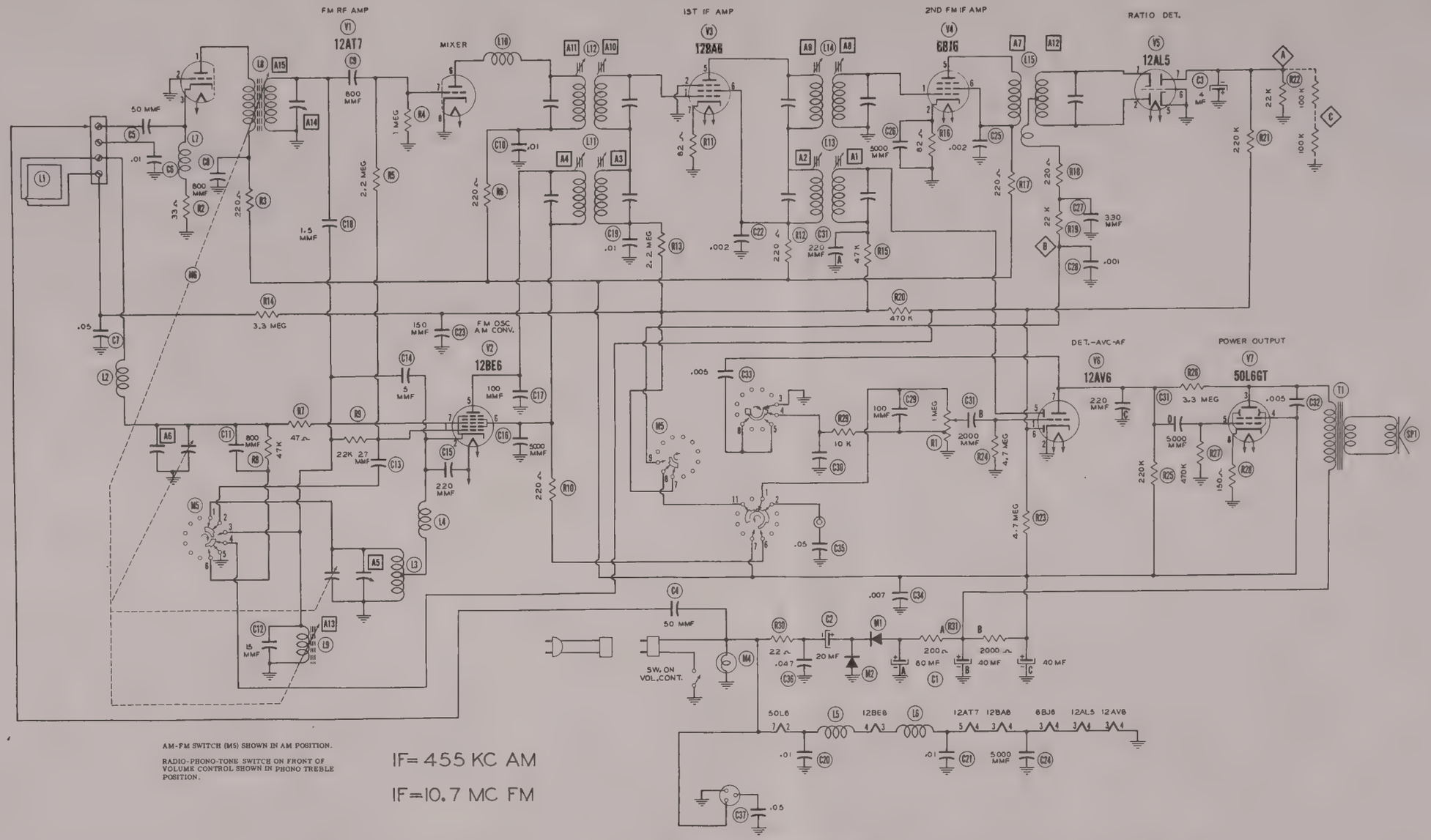


FIG. 2



AM-FM SWITCH (M5) SHOWN IN AM POSITION.

RADIO-PHONO-TONE SWITCH ON FRONT OF VOLUME CONTROL SHOWN IN PHONO TREBLE POSITION.

IF= 455 KC AM

IF=10.7 MC FM

RADIO - PHONO SWITCH IN POSITION #1 (RADIO - TREBLE).

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	12AT7	†110VDC	0V.	†-.4VDC	42VAC	55VAC	†110VDC	†-1.4VDC	0V.	50VAC
V 2	12BE6	†-6.4VDC ▲-12VDC	0V.	55VAC	67VAC	†110VDC ▲105VDC	†110VDC ▲105VDC	†-.2VDC ▲-.3VDC		
V 3	12BA6	0V.	0V.	42VAC	30VAC	†110VDC ▲105VDC	†110VDC ▲105VDC	1.3VDC		
V 4	6BJ6	0V.	1VDC	30VAC	24VAC	†110VDC	†110VDC	0V.		
V 5	12AL5	†-.4VDC	†-.4VDC	24VAC	12VAC	0V.	0V.	†.6VDC		
V 6	12AV6	-.7VDC	0V.	12VAC	0V.	†-.6VDC ▲-.5VDC	†-.4VDC ▲0V.	65VDC		
V 7	50L6GT	110VDC	87VAC	200VDC	110VDC	0V.	65VDC	117VAC	7.5VDC	

† TAKEN WITH VACUUM TUBE VOLTMETER.

† TAKEN IN "FM" POSITION.
▲ TAKEN IN "AM" POSITION.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	12AT7	†2.4KΩ	0Ω	34Ω	43Ω	52Ω	†2.4KΩ	700KΩ	0Ω	48Ω
V 2	12BE6	22KΩ	1.9Ω	53Ω	58Ω	†2.4KΩ	†2.4KΩ	†47KΩ ▲4.3 Meg.		
V 3	12BA6	†3.2 Meg. ▲2.5 Meg.	0Ω	43Ω	30Ω	†2.4KΩ	†2.4KΩ	82Ω		
V 4	6BJ6	1.6Ω	82Ω	30Ω	28Ω	†2.4KΩ	†2.4KΩ	0Ω		
V 5	12AL5	† 1 Meg.	† 1 Meg.	26Ω	15Ω	0Ω	0Ω	22KΩ		
V 6	12AV6	4.7 Meg.	0Ω	15Ω	0Ω	†800KΩ ▲380KΩ	†2.5 Meg. ▲0Ω	†220KΩ		
V 7	50L6GT	†2.2KΩ	59Ω	†530Ω	†2.2KΩ	470KΩ	†220KΩ	95Ω	150Ω	

† MEASURED FROM OUTPUT OF M1.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

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PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA				INSTALLATION NOTES
	RESISTANCE	WATTS	WESTING. PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	
R1A	Switch		V-9824-1				Radio-Phono-Tone Switch-front
B	1 Meg.	½					Volume control and switch -tapped at 200KΩ-rear

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		IDENTIFICATION CODES
	RESISTANCE	WATTS	WESTINGHOUSE PART No.	IRC PART No.	
R2	33Ω	½	RC20AE330M		FM RF Cathode
R3	220Ω	½	RC20AE221M	BTS-220	FM RF Plate
R4	1 Meg.	½	RC20AE105M	BTS-1 Meg.	FM Mixer Grid
R5	2.2 Meg.	½	RC20AE225M	BTS-2.2 Meg.	Voltage Divider
R6	220Ω	½	RC20AE221M	BTS-220	FM Mixer Plate
R7	47Ω	½	RC20AE470M		Parasitic Suppressor
R8	47KΩ	½	RC20AE473M	BTS-47K	AM Conv. Grid
R9	22KΩ	½	RC20AE223K	BTS-22K	FM Osc. Grid
R10	220Ω	½	RC20AE221M	BTS-220	AM Conv. Plate Decoupling
R11	82Ω	½	RC20AE820K	BTS-82	1st IF Amp. Cathode
R12	220Ω	½	RC20AE221M	BTS-220	1st IF Amp. Decoupling
R13	2.2 Meg.	½	RC20AE225M	BTS-2.2 Meg.	AVC Network
R14	3.3 Meg.	½	RC20AE335M	BTS-3.3 Meg.	AVC Network
R15	47KΩ	½	RC20AE473M	BTS-47K	Diode Filter
R16	82Ω	½	RC20AE820K	BTS-82	2nd FM IF Cathode
R17	220Ω	½	RC20AE221M	BTS-220	2nd FM IF Decoupling
R18	220Ω	½	RC20AE221M	BTS-220	Balancing
R19	22KΩ	½	RC20AE223M	BTS-22K	De-emphasis
R20	470KΩ	½	RC20AE474M	BTS-470K	AVC Network
R21	220KΩ	½	RC20AE224M	BTS-220K	AVC Network
R22	22KΩ	½	RC20AE223K	BTS-22K	Ratio Det. Diode Load
R23	4.7 Meg.	½	RC20AE475M	BTS-4.7 Meg.	Delayed AVC Network
R24	4.7 Meg.	½	RC20AE475M	BTS-4.7 Meg.	AF Amp. Grid
R25	220KΩ	½	RC20AE224K	BTS-220K	AF Amp. Plate
R26	3.3 Meg.	½	RC20AE335M	BTS-3.3 Meg.	Feedback
R27	470KΩ	½	RC20AE474M	BTS-470K	Output Grid
R28	150Ω	1	RC20AE151K	BTA-150	Output Cathode
R29	10KΩ	½	RC20AE103M	BTS-10K	Tone Compensation
R30	22Ω	6	V-6067-7		Rect. Ballast-Wire Wound
R31A	200Ω	3	V-10054	1 3/4A-2250	Filter-Wire Wound
B	2000Ω	6			Filter-Wire Wound

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		WESTING. PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
	PRI.	SEC.	PRI.	SEC.					
T1	2500Ω	3.6Ω	230Ω	.6Ω	V-9627	A-3876	A-2928	RO-2	

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA			INSTALLATION NOTES
			WESTINGHOUSE PART No.	VIKING PART No.	QUAM PART No.	
	FIELD	V. C. IMP.				
SP1	PM	3.6Ω	V-9770-2	10J12	10A4A	
	CONE DIA.	V. C. DIA.				
SP2	9 1/2"	1"				

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA			NOTES
		PRI.	SEC.	WESTINGHOUSE PART No.	MEISSNER PART No.	IRC PART No.	
L1	AM Loop Ant.	1Ω		V-5982-6			3 turns around rear of cabinet.
L2	AM Ant. Loading Coil	2Ω		V-6157			
L3	AM Osc.	10Ω		V-9672	14-1073		Tap at 1.2Ω
L4	RF Choke	.9Ω		V-9099-1		CLA-1.2	1.2 microhenries
L5	Fil. Choke	.9Ω		V-9099-1		CLA-1.2	1.2 microhenries
L6	Fil. Choke	.9Ω		V-9099-1		CLA-1.2	1.2 microhenries
L7	Cath. Chk.	.9Ω		V-9099-1		CLA-1.2	1.2 microhenries
L8	FM RF	0Ω	0Ω	V-9674			
L9	FM Osc.	0Ω		V-9675			
L10	Para. Supp.	0Ω		V-4886-12			
L11	1st AM IF	16Ω	16Ω	V-9649-1	16-6758		
L12	1st FM IF	1.6Ω	1.6Ω	V-9688	16-3487		
L13	2nd AM IF	17Ω	17Ω	V-6130-1	16-6758		
L14	2nd FM IF	1.6Ω	1.6Ω	V-9642	16-3487		
L15	Ratio Det. Trans.	2.7Ω	.4Ω	V-9828			

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA			NOTES
	CURRENT	WESTINGHOUSE PART No.	SYLVANIA PART No.	SELETRON PART No.	
M1	.097A	V-9640	ND-5	6P2	
M2	.097A	V-9640	ND-5	6P2	

PHONO CARTRIDGE and NEEDLE

ITEM No.	REPLACEMENT DATA					REMARKS
	WESTINGHOUSE PART No.	ASTATIC PART No.		SHURE PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M3		AC-AG-J	A-AG	W26B	A66U	

ASTATIC AND SHURE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED.

DIAL LIGHTS

ITEM No.	BASE TYPE	VOLTS	AMPS.	BEAD COLOR	REPLACEMENT DATA		NOTES
					WESTINGHOUSE PART No.		
M4	Bayonet	117		Clear	6S6		Type 117V 6 watt

MISCELLANEOUS

ITEM No.	PART NAME	WESTINGHOUSE PART No.	NOTES
M5	Switch	V-9681-1	AM-FM
M6	Tuning Gang	V-9671-2	
A14	Trimmer	V-9670	FM RF Adj.
	Cabinet	V-1212-1	
	Dial Pointer	V-9826-3	
	Knob	V-6146-1	On-Off/Volume
	Knob	V-6146-5	AM-FM
	Knob	V-9861-1	Radio-Phono-Tone
	Knob	V-9104-6	Tuning

PHOTOFACT* Folder

WESTINGHOUSE MODELS
H-611C12, H-615C12 (CH. V-2152-16)

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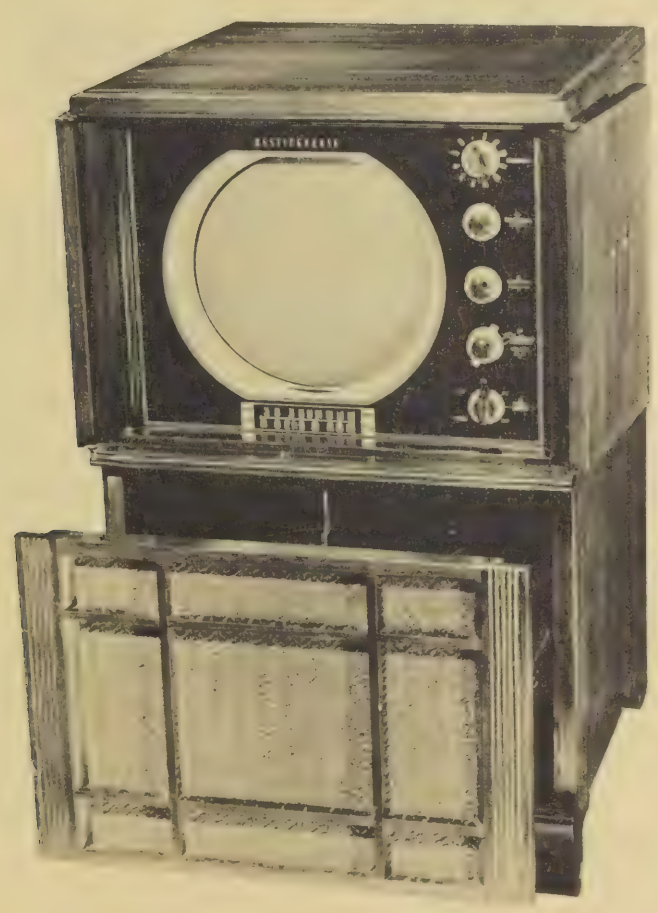

MODEL H-611C12

WESTINGHOUSE MODELS
H-611C12, H-615C12 (CH. V-2152-16)

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Date 11/50 Set No. 112—Folder No. 14

WESTINGHOUSE MODEL H-611C12, H-615C12 (Ch. V-2152-16)

WESTINGHOUSE MODEL H-611C12, H-615C12 (Ch. V-2152-16)

WESTINGHOUSE MODEL H-611C12

TRADE NAME	Westinghouse, Models H-611C12, H-615C12 (Chassis V-2152-16)
MANUFACTURER	Westinghouse Electric Corp., Home Radio Div., Sunbury, Pa.
TYPE SET	TV-FM-AM-Phono Combination Receiver
TUBES	Thirty
POWER SUPPLY	110 - 120 Volts AC - 60 Cycle
RATINGS	2.6 Amp. @ 117Volts AC (TV) , 1.8 Amp. @ 117 Volts AC (Radio)
TUNING RANGE	TV Channels 2 thru 13
	FM 88 - 108 MC
	AM 540 - 1600 KC

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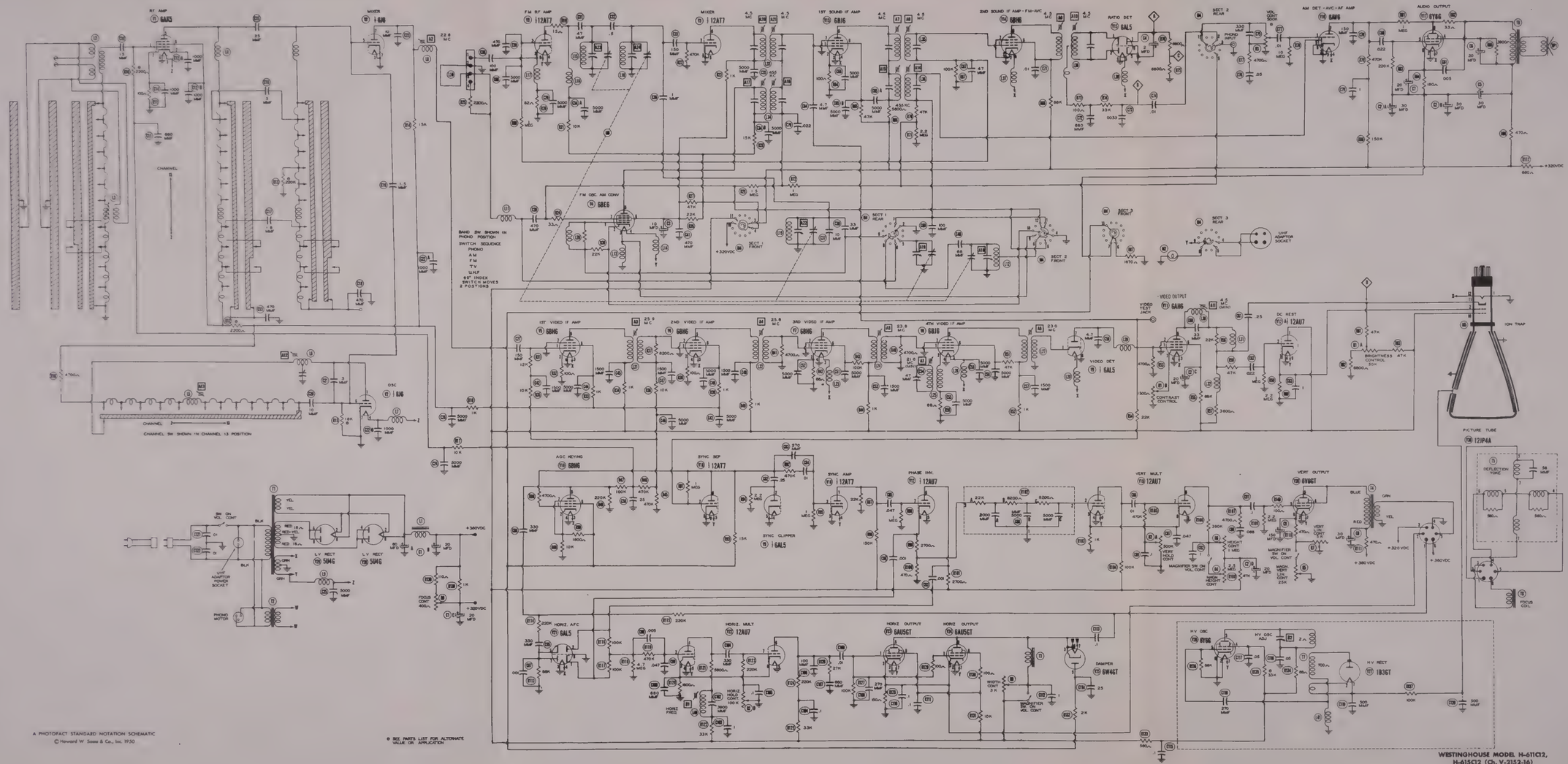

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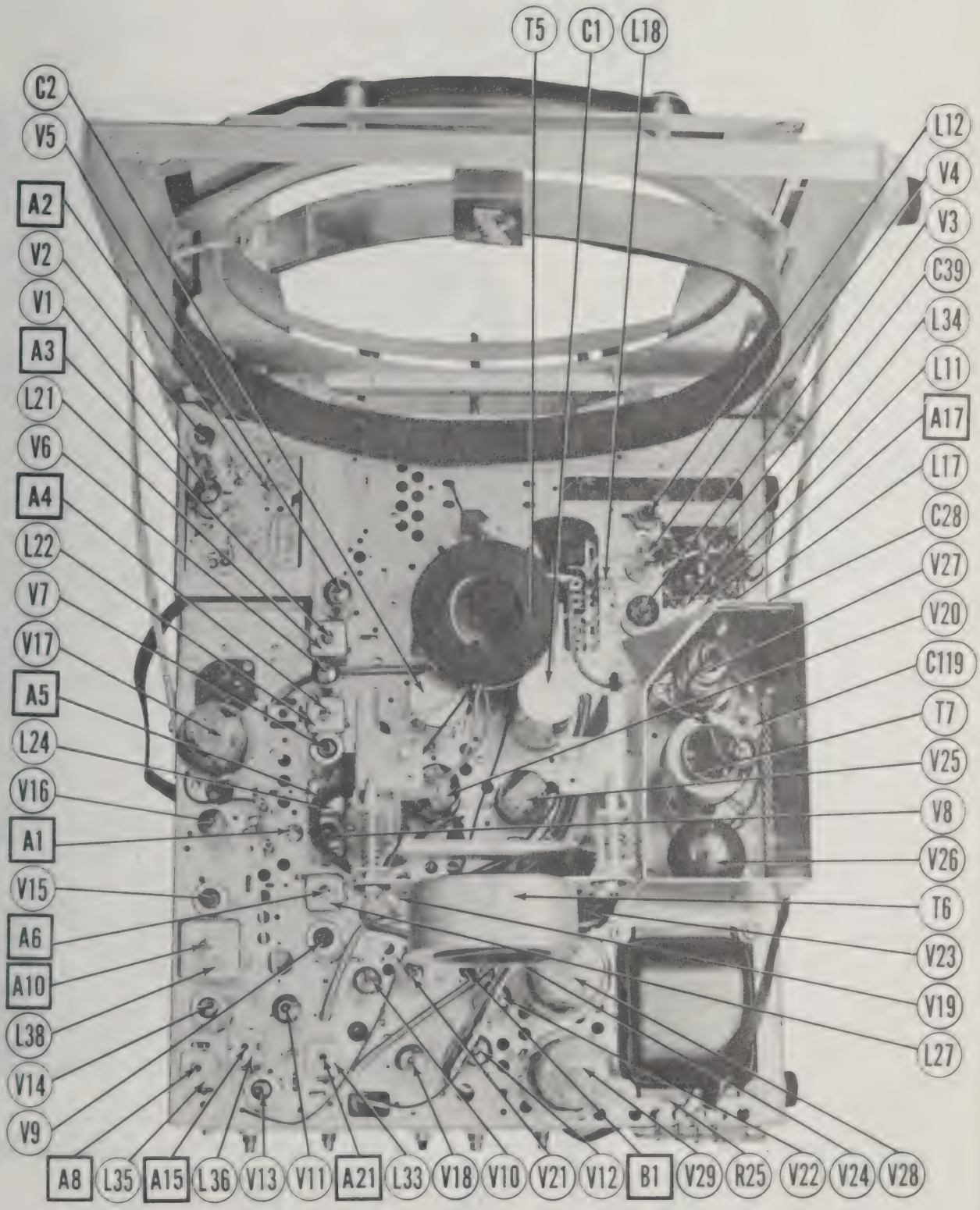
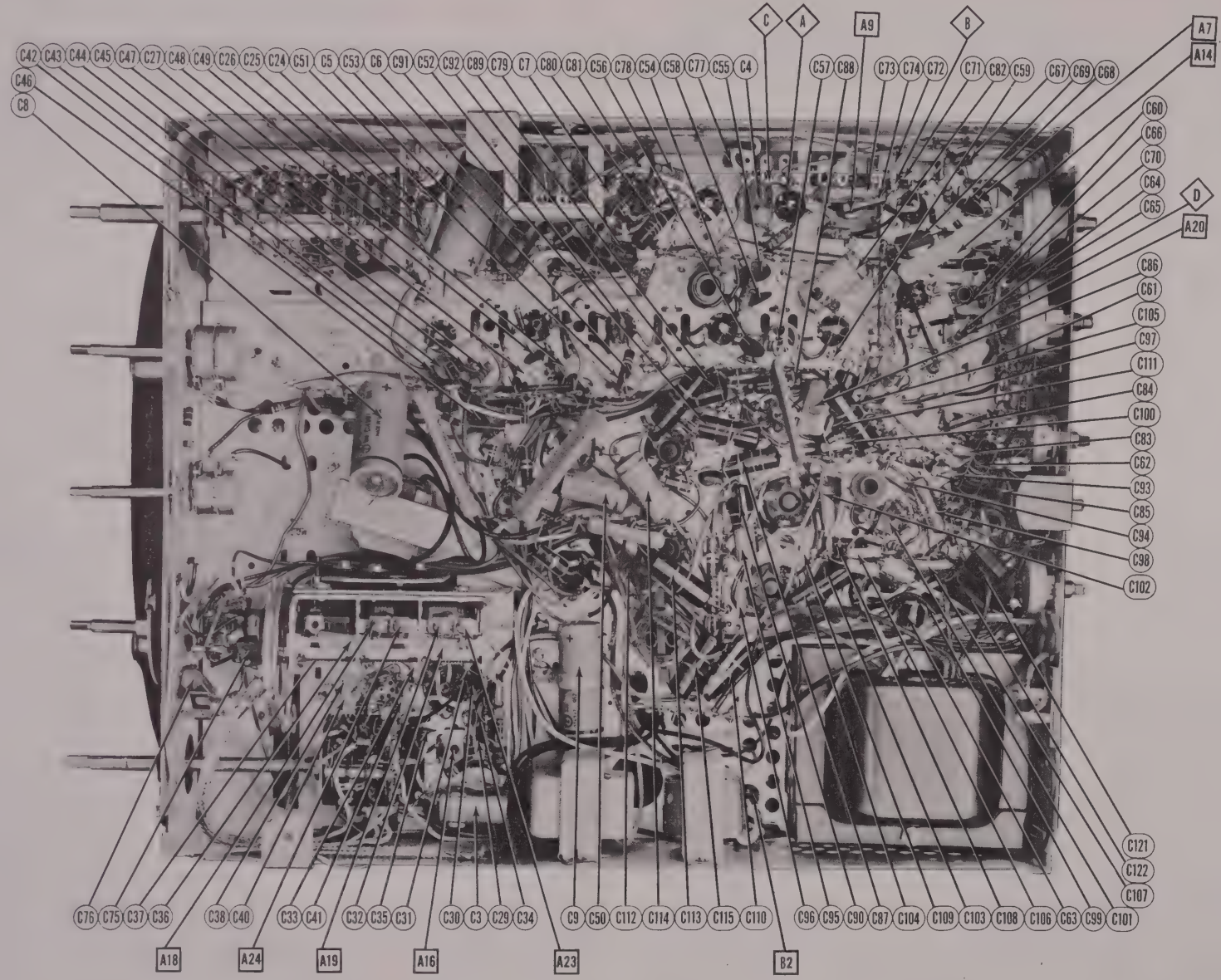
⊕ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

WESTINGHOUSE MODEL H-611C12, H-615C12 (Ch. V-2152-16)

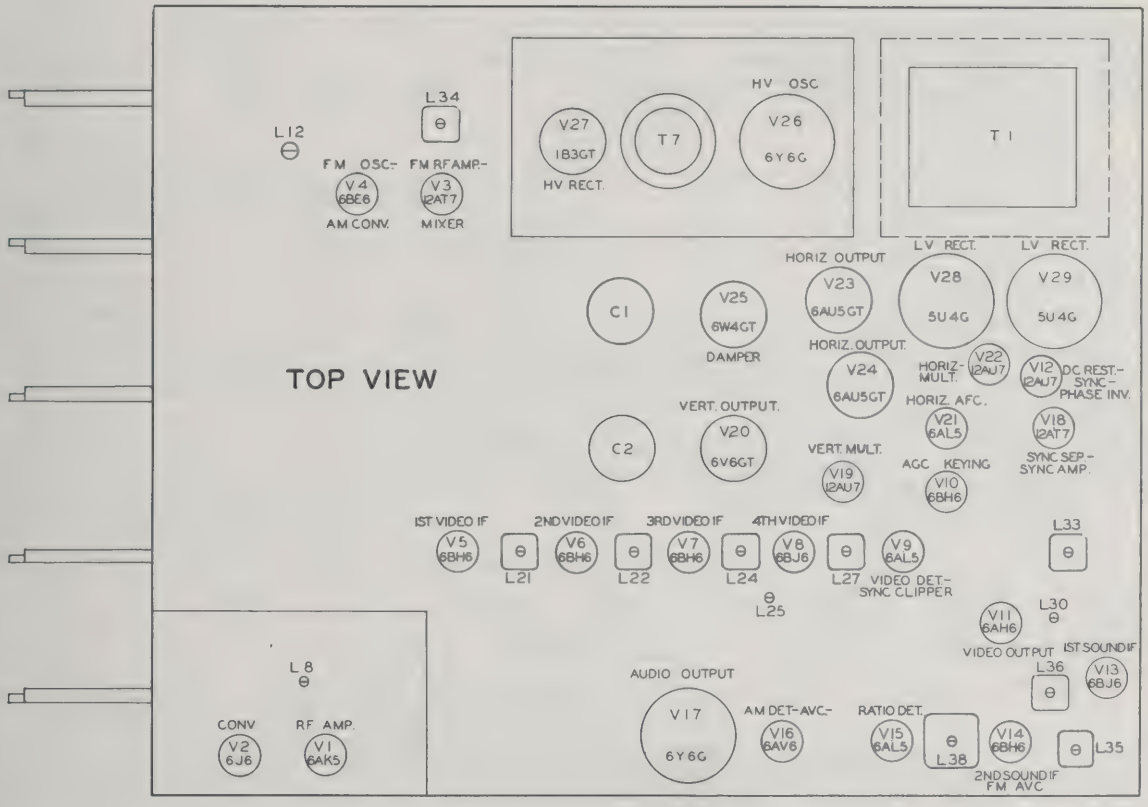
WESTINGHOUSE MODEL H-611C12, H-615C12 (Ch. V-2152-16)

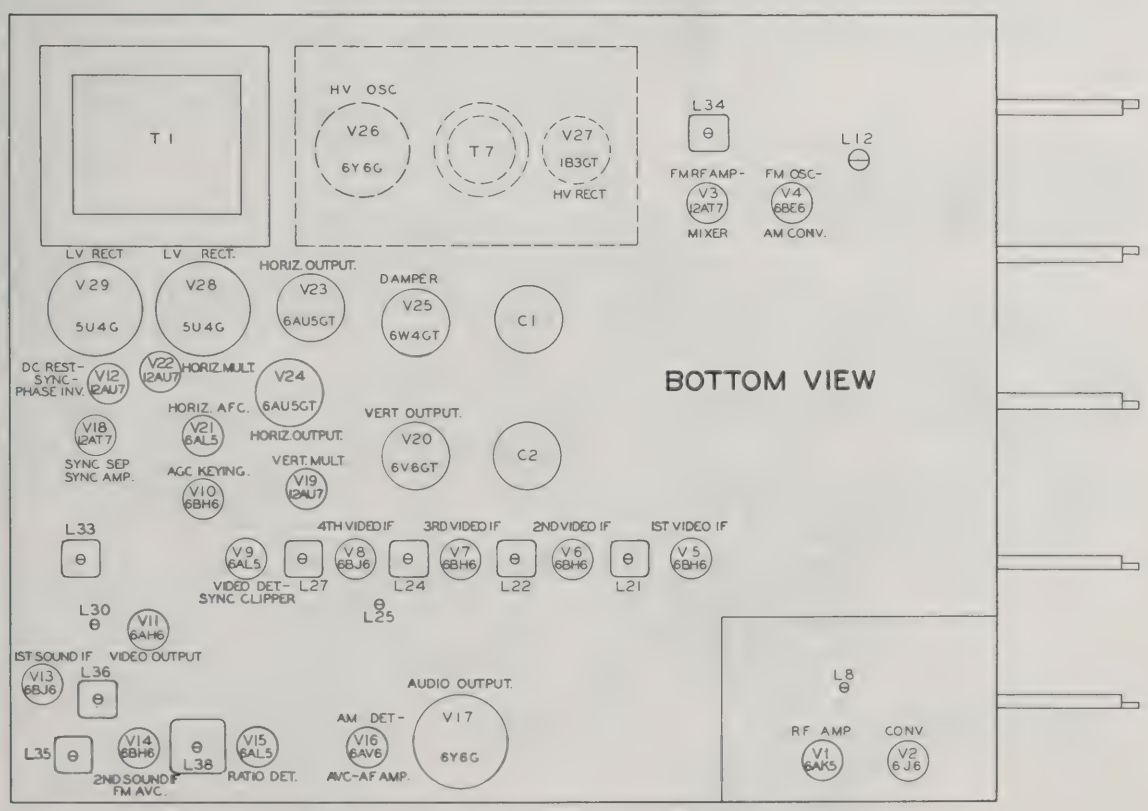


CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW-CAPACITOR AND ALIGNMENT IDENTIFICATION





TUBE PLACEMENT CHART

TV ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

If the picture tube is to be removed during alignment, the high voltage lead should be securely taped and dressed away from the chassis.

VIDEO IF ALIGNMENT

Turn the function switch to TV position (3rd position clockwise).
Remove the converter tube (V2) from its socket and replace with a 6J6 with pin 1 removed to prevent erroneous indications.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	Direct	High side to ungrounded tube shield floating over "dummy" converter tube (V2). Low side to chassis.	21.6MC (Unmod.)	Any	DC Probe to Video Test Jack. Common to chassis.	A1	Adjust for minimum deflection.
2.	Direct	"	22.6MC	"	"	A2	Adjust for maximum deflection. Attenuate signal generator to maintain a maximum -2 volts reading.
3.	Direct	"	25.9MC	"	"	A3	"
4.	Direct	"	25.6MC	"	"	A4	"
5.	Direct	"	23.8MC	"	"	A5	"
6.	Direct	"	23MC	"	"	A6	"

OVERALL VIDEO IF RESPONSE CHECK

Connect the synchronized sweep voltage from the signal generator to the horizontal input of the oscilloscope for horizontal deflection.
Construct a filter for oscilloscope consisting of a 200KΩ resistor in series with the vertical input lead of the oscilloscope, and a 500MMF capacitor across the vertical input terminals.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
7.	Direct	High side to ungrounded tube shield floating over "dummy" converter tube (V2). Low side to chassis.	25.3MC (10MC SWP)	21.6MC 22.5MC 23.5MC 25.3MC 26.1MC	Any	Vert. Amp. to Video Test Jack. Low side to chassis.		Check for response curve similar to figure 1. The 22.5MC and 26.1MC markers should be at 40-50% of response. If necessary, slightly retouch A2 thru A6 for proper response.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
8.	.01MFD	High side to Video Test Jack. Low side to chassis.	4.5MC (Unmod.)	Any	DC Probe to Point (A). Common to chassis.	A7, A8, A9	Adjust for maximum deflection.
9.	.01MFD	"	"	"	DC Probe to Point (B). Common to Point (C).	A10	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60 ∿ modulation and 450KC sweep. Use 120 ∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
8.	.01MFD	High side to Video Test Jack. Low side to chassis.	4.5MC (450KC SWP)	4.5MC	Any	Vert. Amp. to Point (A). Low side to chassis.	A7, A8, A9	Disconnect stabilizer capacitor C4. Adjust for maximum amplitude and symmetry as per figure 2.
9.	.01MFD	"	"	"	"	Vert. Amp. to Point (B). Low side to chassis.	A10	Reconnect capacitor C4. Adjust A10 to place 4.5MC at center of crossover lines as per figure 3. SLIGHTLY retouch A9 for maximum amplitude and straightness of crossover lines.

4.5MC TRAP ADJUSTMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
10.	.001MFD	High side to Video Test Jack. Low side to chassis.	4.5MC (Unmod.)	Any	DC Probe thru detector probe as shown in figure 4 to Point (D). Low side to chassis.	A11	Adjust for MINIMUM deflection.

OSCILLATOR ALIGNMENT

Remove the dummy converter tube and replace the original 6J6 in its socket.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
11.	Two 120Ω carbon res.	Across antenna terminals with 120Ω in each lead.	213MC (10MC SWP)	211.25MC 215.75MC	13	Vert. Amp. to Video Test Jack. Low side to chassis.	A12	Adjust to place sound marker as shown in figure 5. The video marker should be at 50% response.
12.	"	"	207MC (10MC SWP)	205.25MC 209.75MC	12	"		Check all high band channels to set that the sound marker can be placed well within the range of the fine tuning control. If not, a compromise adjustment of A12 may be necessary.
			201MC (10MC SWP)	199.25MC 203.75MC	11			
			195MC (10MC SWP)	193.25MC 197.75MC	10			
			189MC (10MC SWP)	187.25MC 191.75MC	9			
			183MC (10MC SWP)	181.25MC 185.75MC	8			
			177MC (10MC SWP)	175.25MC 179.75MC	7			
13.	"	"	85MC (10MC SWP)	83.25MC 87.75MC	6	"	A13	Adjust to place sound marker as shown in figure 5. The video marker should be at 50% of response.
14.	"	"	79MC (10MC SWP)	77.25MC 81.75MC	5	"		Check all low band channels to set that sound marker can be placed well within the tuning range of the fine tuning control. If not, a compromise adjustment of A13 may be necessary.
			69MC (10MC SWP)	67.25MC 71.75MC	4			
			63MC (10MC SWP)	61.25MC 65.75MC	3			
			57MC (10MC SWP)	55.25MC 59.75MC	2			

THE RF AND MIXER PORTIONS OF THIS RECEIVER HAVE BEEN PROPERLY ALIGNED AT THE FACTORY AND ARE VERY STABLE. THEY WILL NOT NORMALLY REQUIRE ALIGNMENT IN THE FIELD.

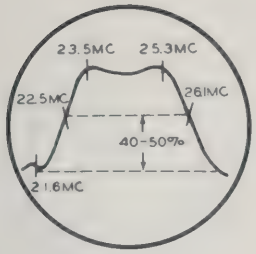


FIG.1

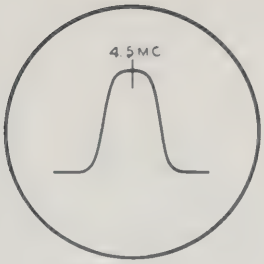


FIG. 2

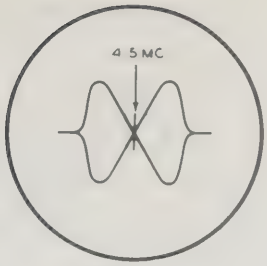


FIG. 3

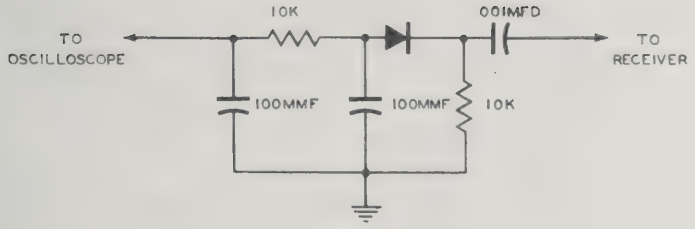


FIG.4

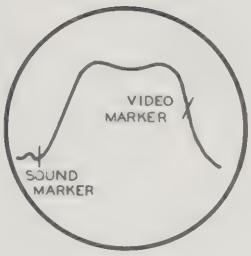


FIG.5

RADIO ALIGNMENT INSTRUCTIONS

AM ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
15.	.1MFD	High side to pin 7 (Grid) of 6BE6 (V4). Low side to chassis.	455KC (400∿ Mod.)	AM (1st position clock-wise)	Tuning gang fully open	Across voice coil	A14, A15, A16, A17	Adjust for maximum output.
16.	.1MFD	"	1615KC	"	"	"	A18	"
17.		Loop	1400KC	"	Tune for max.	"	A19	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output. Adjust for maximum output while rocking tuning gang.

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

If FM IF Alignment is to be performed only, refer to steps 8 and 9 of TV Sound IF Alignment.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
18.	.01MFD	High side to pin 7 (Grid) of 12AT7 (V3). Low side to chassis.	4.5MC (Unmod.)	FM (3rd position CW)	Tuning gang fully open	DC Probe to Point (A). Common to chassis.	A20, A21	Adjust for maximum deflection.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
18.	.01MFD	High side to pin 7 (Grid) of 12AT7 (V3). Low side to chassis.	4.5MC (450KC SWP)	FM (3rd position CW)	Tuning gang fully open	Vert. Amp. to Point (A). Low side to chassis.	A20, A21	Disconnect stabilizer capacitor C4. Adjust for maximum amplitude and symmetry as per figure 2 as in TV sound IF alignment. Reconnect capacitor C4.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
19.	300Ω carbon res.	High side thru 300Ω to #1 antenna terminal. Low side to chassis.	108.5MC (Unmod.)	FM (3rd position CW)	Tuning gang fully open	DC Probe to Point (A). Common to chassis.	A22	Adjust for maximum deflection.
20.	"	"	105MC	"	Tune for max. deflection	"	A23, A24	Adjust for maximum deflection while rocking tuning gang.

VOLTAGE AND RESISTANCE MEASUREMENTS

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AK5	-.4VDC	.7VDC	6.3VAC	0V.	100VDC	100VDC	.7VDC		
V 2	6J6	90VDC	75VDC	0V.	6.3VAC	-1.5VDC	§-5.4VDC	0V.		
† V 3	12AT7	230VDC	0V.	.9VDC	0V.	0V.	120VDC	-.4VDC	0V.	6.3VAC ‡
V 4	6BE6	‡§-3.6VDC #§-4VDC	0V.	0V.	6.3VAC	‡210VDC #220VDC	‡120VDC #115VDC	‡ 0V. #-.2VDC		
V 5	6BH6	-.2VDC	.7VDC	6.3VAC	0V.	340VDC	130VDC	0V.		
V 6	6BH6	-.2VDC	.7VDC	6.3VAC	0V.	340VDC	130VDC	0V.		
V 7	6BH6	0V.	.6VDC	6.3VAC	0V.	340VDC	120VDC	0V.		
V 8	6BJ6	0V.	1.1VDC	6.3VAC	0V.	340VDC	130VDC	0V.		
V 9	6AL5	0V.	-.8VDC	6.3VAC	0V.	0V.	0V.	-.4VDC		
V 10	6BH6	▲-75VDC	▲-20VDC	6.3VAC	0V.	▲-125VDC	▲0V.	▲-20VDC		
V 11	6AH6	-.4VDC	0V.	6.3VAC	0V.	320VDC	300VDC	7.3VDC		
V 12	12AU7	350VDC	0V.	11VDC	0V.	0V.	330VDC	0V.	6VDC	6.3VAC
V 13	6BJ6	-.2VDC	1.4VDC	0V.	6.3VAC	270VDC	175VDC	0V.		
V 14	6BH6	-.5VDC	0V.	0V.	6.3VAC	85VDC	85VDC	0V.		
V 15	6AL5	-1.2VDC	-1.2VDC	6.3VAC	0V.	0V.	0V.	4.8VDC		
# V 16	6AV6	-.5VDC	0V.	0V.	6.3VAC	-.4VDC	0V.	95VDC		
V 17	6Y6G	0V.	0V.	▲165VDC	▲165VDC	▲0V.	▲170VDC	6.3VAC	▲15VDC	
V 18	12AT7	26VDC	-.6VDC	0V.	6.3VAC	6.3VAC	55VDC	0V.	0V.	0V.
V 19	12AU7	65VDC	.9VDC	3VDC	0V.	0V.	120VDC 75VDC	-22VDC	3VDC	6.3VAC
V 20	6V6GT	.4VDC 35VDC	0V.	350VDC	350VDC	0V.	0V.	6.3VAC	20VDC 40VDC	
V 21	6AL5	3.2VDC	-3.2VDC	0V.	6.3VAC	0V.	0V.	0V.		
V 22	12AU7	185VDC	.3VDC	8.2VDC	0V.	0V.	110VDC	7.5VDC	8.2VDC	6.3VAC
V 23	6AU5GT	3VDC	0V.	18VDC	0V.	*	0V.	6.3VAC	185VDC	
V 24	6AU5GT	3VDC	0V.	18VDC	0V.	*	0V.	6.3VAC	185VDC	
V 25	6W4GT	0V.	0V.	*	0V.	45VDC	0V.	*	*	
V 26	6Y6G	0V.	0V.	320VDC	130VDC	-55VDC	0V.	6.3VAC	0V.	
V 27	1B3GT	* DO NOT MEASURE.								
V 28	5U4G	0V.	380VDC	350VDC	340VAC	0V.	340VAC	0V.	380VDC	
V 29	5U4G	0V.	380VDC	0V.	340VAC	0V.	340VAC	0V.	380VDC	
V 30	12LP4A	0V.	13VDC	PIN 10 350VDC	PIN 11 180VDC	PIN 12 6.3VAC				

RESISTANCE READINGS

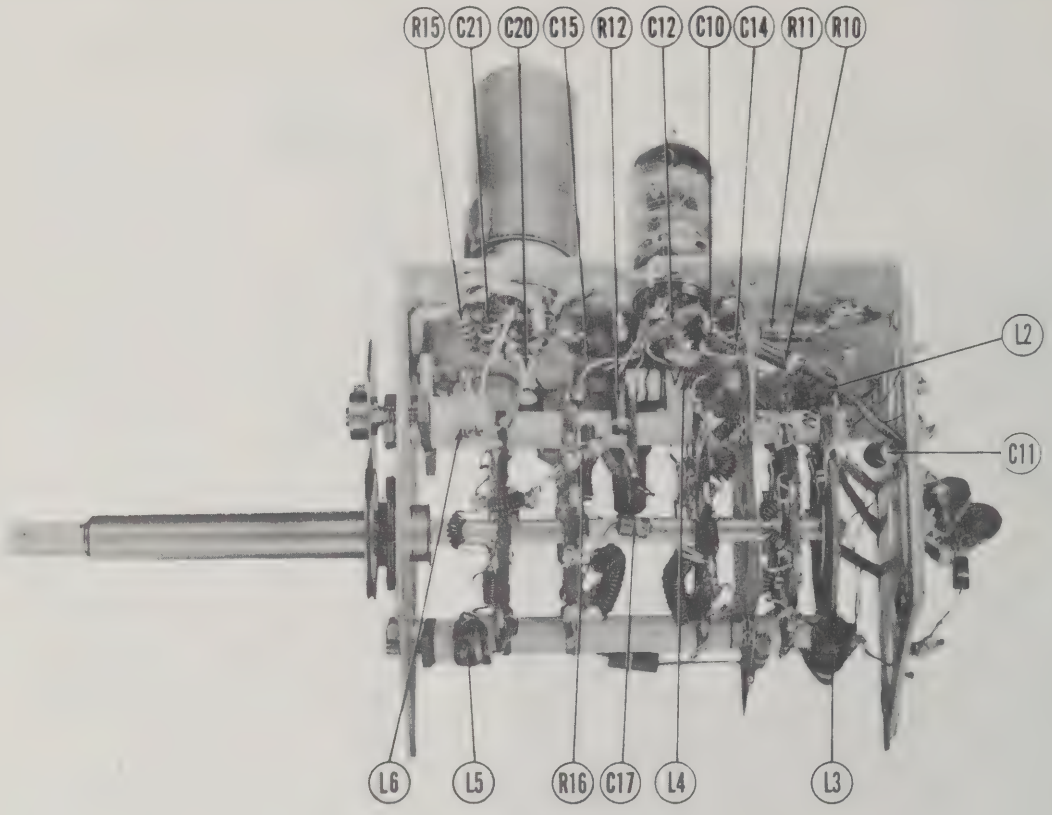
Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AK5	270KΩ	100Ω	.6Ω	0Ω	▲3.2KΩ	▲3.2KΩ	100Ω		
V 2	6J6	▲5.7KΩ	▲16KΩ	0Ω	.6Ω	270KΩ	18KΩ	0Ω		
† V 3	12AT7	†10KΩ	1.1 Meg.	85Ω	0Ω	0Ω	†23KΩ	470KΩ	0Ω	.1Ω ‡
V 4	6BE6	22KΩ	‡ 0Ω #.6Ω	.1Ω	.2Ω	†15KΩ	†17KΩ	‡ 33Ω #2.7 Meg		
V 5	6BH6	350KΩ	100Ω	.1Ω	0Ω	†1.1KΩ	▲1000Ω	0Ω		
V 6	6BH6	350KΩ	100Ω	.1Ω	0Ω	†1.1KΩ	▲1000Ω	0Ω		
V 7	6BH6	.9Ω	68Ω	.9Ω	0Ω	†1.1KΩ	†100KΩ	0Ω		
V 8	6BJ6	.9Ω	68Ω	.9Ω	0Ω	†1.1KΩ	†48KΩ	0Ω		
V 9	6AL5	.9Ω	2.2 Meg.	1.7Ω	0Ω	0Ω	0Ω	4.7KΩ		
V 10	6BH6	▲20KΩ	▲1.8KΩ	.1Ω	0Ω	200KΩ	▲0Ω	▲1.8KΩ		
V 11	6AH6	4.7KΩ	0Ω	.1Ω	0Ω	†3.7KΩ	†70KΩ	1.5KΩ		
V 12	12AU7	†110Ω	1 Meg.	2.2 Meg.	0Ω	0Ω	†2.8KΩ	1 Meg.	3.1KΩ	.1Ω
V 13	6BJ6	1 Meg.	100Ω	0Ω	.1Ω	†6KΩ	†47KΩ	0Ω		
V 14	6BH6	100KΩ	0Ω	0Ω	.9Ω	†68KΩ	†68KΩ	0Ω		
V 15	6AL5	Inf.	Inf.	.9Ω	0Ω	0Ω	0Ω	14KΩ		
# V 16	6AV6	10 Meg.	0Ω	0Ω	.1Ω	550KΩ	0Ω	†400KΩ		
V 17	6Y6G	Inf.	0Ω	†530Ω	†5KΩ	▲220KΩ	†500Ω	.1Ω	▲180Ω	
V 18	12AT7	†60KΩ	1 Meg.	0Ω	.1Ω	.1Ω	▲15KΩ	27KΩ	0Ω	0Ω
V 19	12AU7	†100KΩ	39KΩ	1000Ω	0Ω	0Ω	†450KΩ †1.5 Meg	470KΩ	1000Ω	.1Ω
V 20	6V6GT	5KΩ 0Ω	0Ω	†1.1KΩ	†1.1KΩ	2.2 Meg.	2.2 Meg.	.1Ω	5.5KΩ 470Ω	
V 21	6AL5	4.8 Meg.	4.8 Meg.	0Ω	.1Ω	68KΩ	0Ω	68KΩ		
V 22	12AU7	†38KΩ	5 Meg.	1.8KΩ	0Ω	0Ω	†250KΩ	320KΩ	1.8KΩ	.1Ω
V 23	6AU5GT	100KΩ	0Ω	150Ω	Inf.	†500Ω †3.5KΩ	Inf.	.1Ω	†10KΩ	
V 24	6AU5GT	100KΩ	0Ω	150Ω	Inf.	†500Ω †3.5KΩ	Inf.	.1Ω	†10KΩ	
V 25	6W4GT	Inf.	† Inf.	†500Ω †3.5KΩ	Inf.	▲2000Ω	Inf.	†500Ω †3.5KΩ	†500Ω †3.5KΩ	
V 26	6Y6G	0Ω	0Ω	†740Ω	†33KΩ	68KΩ	16Ω	.1Ω	0Ω	
V 27	1B3GT	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	TOP CAP 710Ω
V 28	5U4G	Inf.	50KΩ	†110Ω	18Ω	Inf.	18Ω	Inf.	50KΩ	
V 29	5U4G	Inf.	50KΩ	Inf.	18Ω	Inf.	18Ω	Inf.	50KΩ	
V 30	12LP4A	0Ω	2.2 Meg.	PIN 10 †110Ω	PIN 11 100KΩ	PIN 12 .1Ω				

ALL MEASUREMENTS MADE IN "TV" POSITION UNLESS OTHERWISE NOTED.

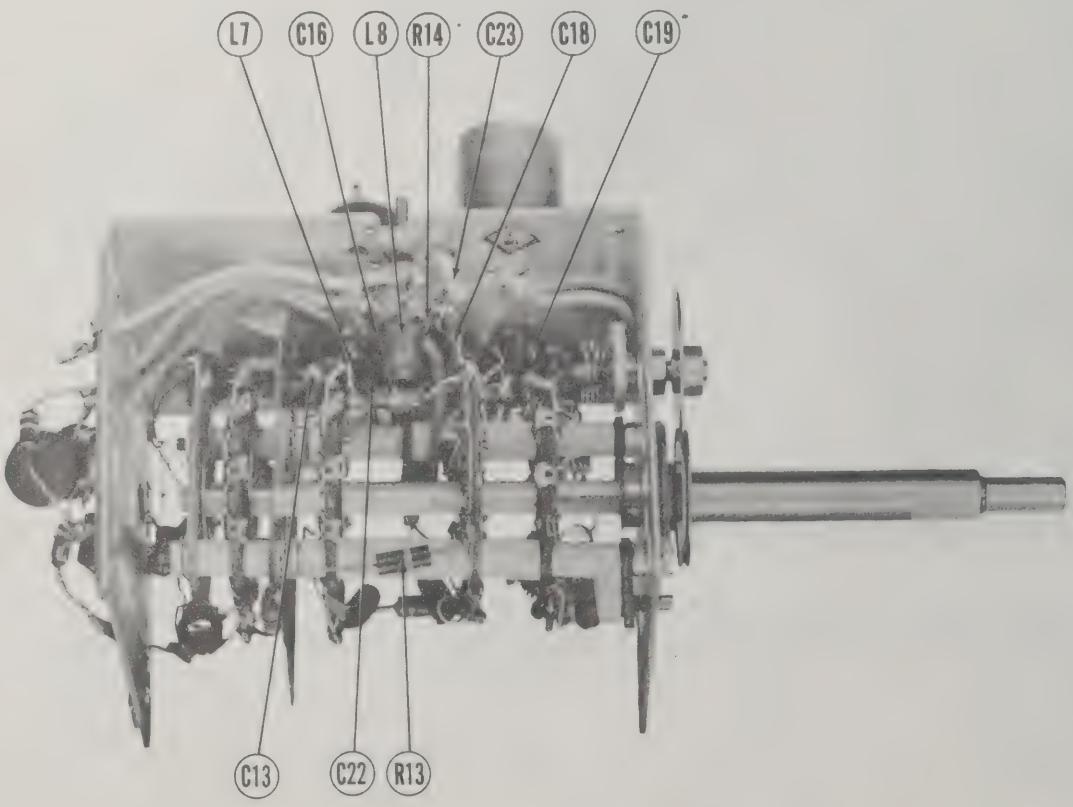
FOCUS CONTROL SET FULLY COUNTERCLOCKWISE.
PICTURE EXPANDER SWITCH IN "NORMAL" POSITION.
§ TAKEN WITH VACUUM TUBE VOLTMETER.
† TAKEN IN "FM" POSITION.
# TAKEN IN "AM" POSITION.
* DO NOT MEASURE.
▲ MEASURED FROM JUNCTION OF R83, R84, C5 and C7.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltage measured at 1,000 ohms.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. Front panels controls set at minimum.
6. Where readings may vary according to the setting of the service controls, both minimum and maximum readings are given.

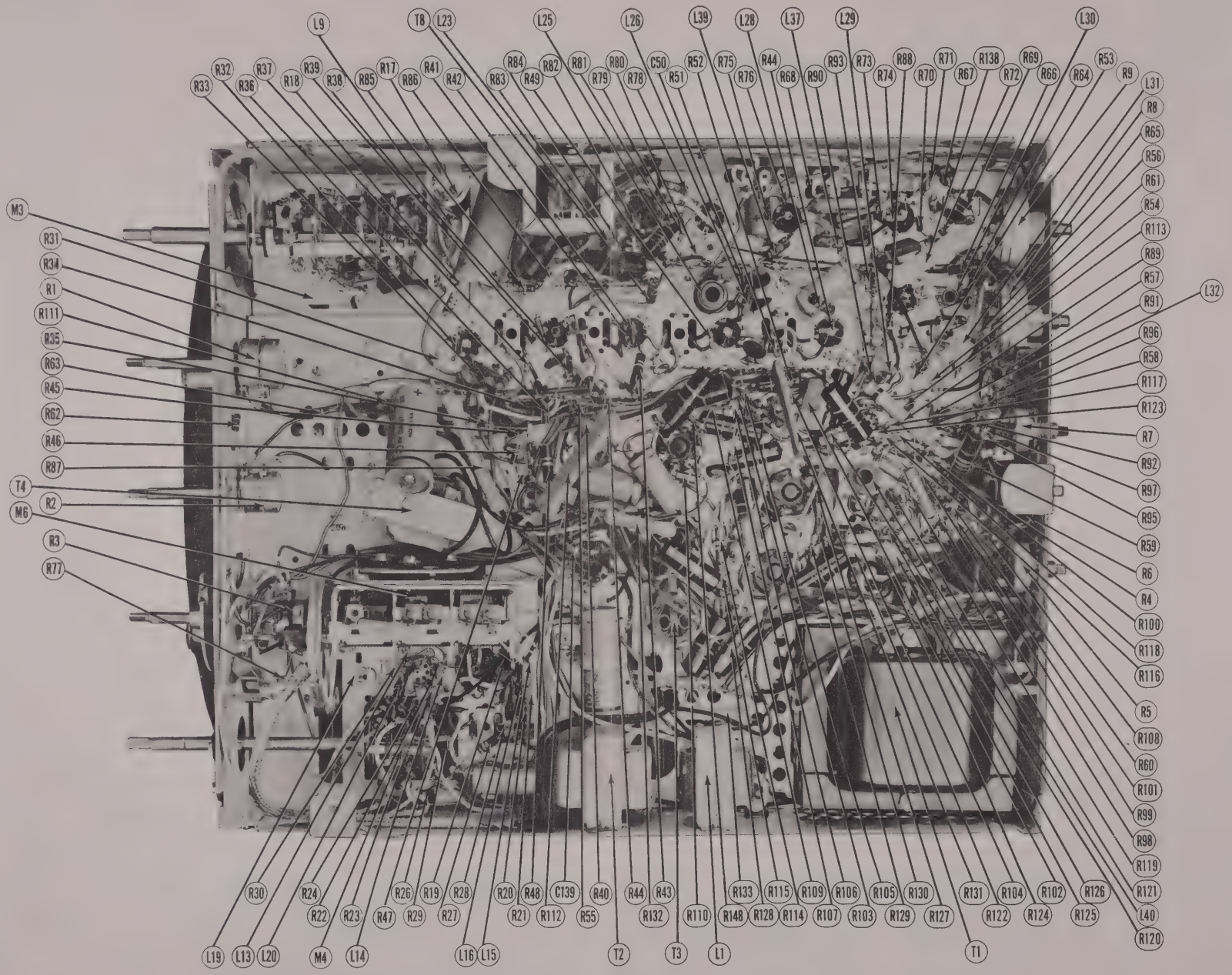
FOCUS CONTROL SET FULLY COUNTERCLOCKWISE.
PICTURE EXPANDER SWITCH IN "NORMAL" POSITION.
‡ TAKEN IN FM" POSITION.
# TAKEN IN "AM" POSITION.
▲ MEASURED FROM JUNCTION OF R83, R84, C5, and C7.
† MEASURED FROM PIN 8 OF V28.



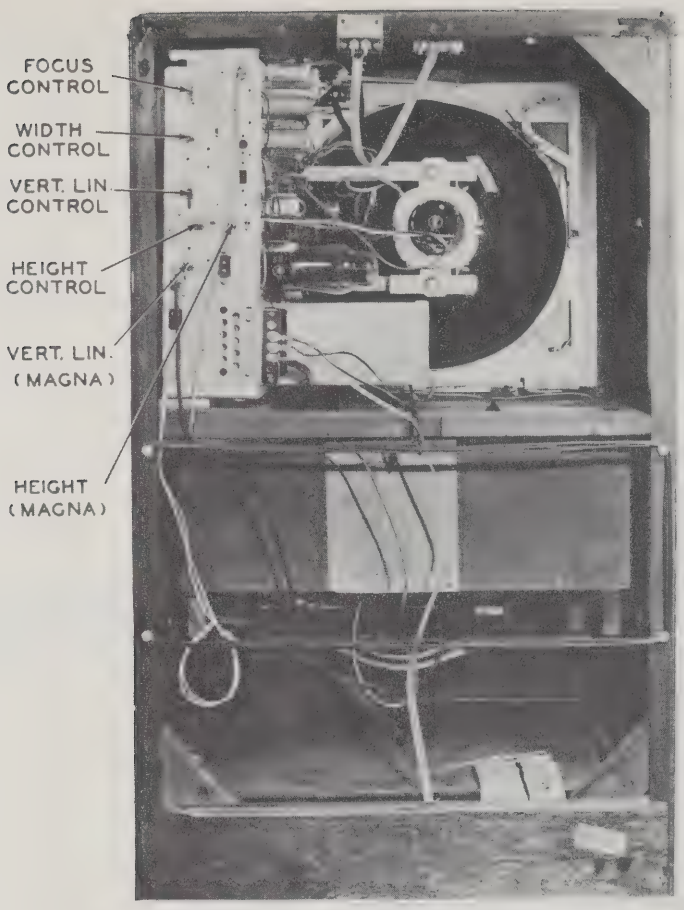
RF TUNER-RIGHT SIDE



RF TUNER-LEFT SIDE



CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION



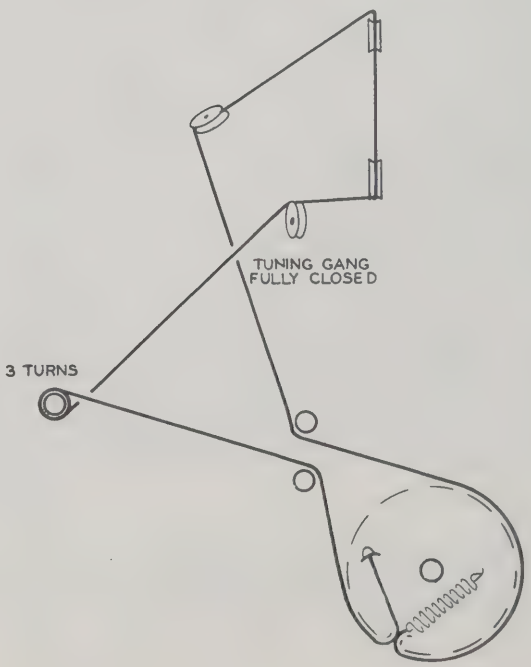
CABINET–REAR VIEW

DISASSEMBLY INSTRUCTIONS

1. Remove ten push-on type control knobs from front of cabinet.
2. Disconnect speaker leads.
3. Disconnect built-in antenna leads.
4. Remove antenna terminal strip.
5. Remove pilot light located beneath chassis.
6. Disconnect phonograph jack from chassis.
7. Remove wooden block holding chassis in place.
8. Remove bolt from brace holding picture tube in place.
9. Remove two hex head bolts holding chassis in cabinet. Remove chassis.
10. Remove nine wood screws holding screen to phono section of cabinet.
11. Remove four wood screws holding bottom plate to phono compartment.
12. Remove four wood screws holding speaker in cabinet. Remove speaker.

NOTE: Chassis must be removed from cabinet for picture tube removal.

DIAL CORD STRINGING



PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA		RMA BASE TYPE	NOTES
		WESTINGHOUSE PART No.	STANDARD REPLACEMENT		
V1	RF Amp.	6AK5	6AK5	7BD	
V2	Converter	6J6	6J6	7BF	
V3	FM RF Amp.-Mixer	12AT7	12AT7	9A	
V4	FM Osc.-AM Conv.	6BE6	6BE6	7CH	
V5	1st Video IF	6BH6	6BH6	7CM	
V6	2nd Video IF	6BH6	6BH6	7CM	
V7	3rd Video IF	6BH6	6BH6	7CM	
V8	4th Video IF	6BJ6	6BJ6	7CM	
V9	Video Det.-Sync. Clipper	6AL5	6AL5	6BT	
V10	AGC Keying	6BH6	6BH6	7CM	
V11	Video Output	6BH6	6BH6	7CM	
V12	DC Rest.-Phase Inv.	12AU7	12AU7	9A	
V13	1st Sound IF	6BJ6	6BJ6	7CM	
V14	2nd Sound IF-FM AVC	6BH6	6BH6	7CM	
V15	Ratio Det.	6AL5	6AL5	6BT	
V16	Det.-AM AVC-AF Amp.	6AV6	6AV6	7BT	
V17	Audio Output	6Y6G	6Y6G	7AC	
V18	Sync. Sep.-Sync. Amp.	12AT7	12AT7	9A	
V19	Vert. Mult.	12AU7	12AU7	9A	
V20	Vert. Output	6V6GT	6V6GT	7AC	
V21	Hor. AFC	6AL5	6AL5	6BT	
V22	Hor. Mult.	12AU7	12AU7	9A	
V23	Hor. Output	6AU5GT	6AU5GT	6CK	
V24	Hor. Output	6AU5GT	6AU5GT	6CK	
V25	Damper	6W4GT	6W4GT	4CG	
V26	HV Osc.	6Y6G	6Y6G	7AC	
V27	HV Rect.	1B3GT	1B3GT	3C	
V28	LV Rect.	5U4G	5U4G	5T	
V29	LV Rect.	5U4G	5U4G	5T	
V30	Picture Tube	12LP4A	12LP4A	12D	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						IDENTIFICATION CODES AND INSTALLATION NOTES
	CAP.	VOLT	WESTINGHOUSE PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	
C1A	60	450	V-9575	AFH1244J		UP6245		TVL-3790	▲ Filter
B	20	450				BR2045A			■ Filter
C	20	450							▲ Filter
C2A	30	400	V-9577	AFH3666J		UP32245		TVL-4763	▲ Decoupling
B	30	400				BR3045A		TVA-2722	■ Decoupling
C	20	400							▲ V. Amp. Screen Decoupling
D	20	400							
C3	10	350	V-9351	PRS350/10		BR1235A		TVA-1604	Decoupling
C4	2	50	V-4880	PRS150/4		BBR2-50		TVA-1301	Stabilizing Cap.
C5	30	450	V-6570	PRS450/30		BR3045A		TVA-1711	Output Decoupling
C6	20	25	V-3236	PRS25/25		BR202A		TVA-1205	Output Screen
C7	20	25	V-3236	PRS25/25		BR202A		TVA-1205	Output Cathode
C8	30	450	V-6570	PRS450/30		BR3045A		TVA-1711	Vert. Output Dec.
C9	150	50	V-9009-1	PRS50/100		BRH15015		TVA-1311	Vert. Output Cath.
				PRS50/50					
C10	15			GP15K	D6-150		GP1K-15		RF Coupling
C11	680			GP680M	D6-681		GP2K-680		AGC Filter
C12A	1000			BPD-2 x 001	DD-2-102		882-2 x 0015	29C7	RF Suppressor
B	1000								RF Decoupling
C13	470			GP470M	D6-471		GP2K-470		RF Decoupling
C14	1000			BPD-001	DD-102		811-001	29C4	RF Cathode
C15	.25								RF Coupling
C16	.5				TCZ-.5				RF Coupling
C17	1.8								RF Coupling
C18	470			GP470M	D6-471		GP2K-470		Mixer Grid Filter
C19	1.5			SIL.5DNPO	TCZ-1.5		NPOK-1.5		Osc. Coupling
C20	10			CN10FNPO	TCZ-10		NPOK-10		Osc. Grid Cap.
C21	3			CN3DNPO	TCZ-3.3		NPOK-3		Osc. Feedback
C22A	1000			BPD-2 x 001	DD-2-102		882-2 x 0015	29C7	RF Bypass
B	1000								Conv. Fil. Bypass
C23	10			CN10DNPO	TCZ-10		NPOK-10		Fixed Trimmer
C24	5000		V-5596	BPD-005	DD-502		811-005	29C1	AGC Filter
C25	5000		V-5596	BPD-005	DD-502		811-005	29C1	Fil. Bypass
C26	5000		V-5596	BPD-005	DD-502		811-005	29C1	RF Bypass
C27	150		R5CC21ZY151M	GP150M	D6-151	5W5T15	GP2K-150	1FM-315	IF Coupling
C28	100		R3CC30SL101M	GP100M	D6-101	5W5T1	GP1K-100	1FM-31	RF Coupling
C29	5000		V-5596	BPD-005	D6-502	1D5D5	811-005	29C1	FM RF Cath.
C30	470		R5CC21ZY471M	GP470M	D6-471	5W5T5	GP2K-470	1FM-35	FM RF Grid Filter
C31	47		R3CC30SL470M	GP47M	D6-470	5W5Q5	GP1K-47	1FM-45	RF Coupling
C32	.5		R3CC20SLR50C		TCZ-.5				RF Coupling
C33	150		R3CC32SL151M	GP150M	D6-151	5W5T15	GP2K-150	1FM-315	RF Coupling
C34A	5000		V-9044-1	BPD-2 x 005	DD-2-502	1D5D5	882-2 x 005	36C2	FM RF Decoup.
B	5000					1D5D5			AM Conv. Decoup.
C35	5000		V-5596	BPD-005	DD-502	1D5D5	811-005	29C1	FM Mixer Decoup.
C36	1		R3CC20SL1ROC		TCZ-1				Osc. Coupling
C37	10		R2CC30CK100D	CN10DNPO	TCZ-10	5R5Q1	NPOK-10	MS-42	Fixed Trimmer
C38	33		R3CC30SL330M	GP33M	D6-330	5W5Q3	GP1K-33	MS-43	Osc. Grid Cap.
C39	470		R5CC21ZY471M	GP470M	D6-471	5W5T5	GP2K-470	1FM-35	IF Coupling
C40	68		R3CC30SL680M	GP68M	D6-680	5W5Q7	GP1K-68	MS-47	Osc. Grid Cap.
C41	470		R5CC21ZY471M	GP470M	D6-471	5W5T5	GP2K-470	1FM-35	Osc. Anode Bypass
C42	1500		R5CC26ZY152M	GP1500M	D6-152	1W5D15	GP2L-0015	1FM-215	AGC Filter
C43	5000		V-5596	BPD-005	DD-502	1D5D5	811-005	29C1	RF Bypass
C44	5000		V-5596	BPD-005	DD-502	1D5D5	811-005	29C1	1st V. IF Screen
C45	1500		R5CC26ZY152M	GP1500M	D6-152	1W5D15	GP2L-0015	1FM-215	1st V. IF Plate Dec.
C46	5000		V-5596	BPD-005	DD-502	1D5D5	811-005	29C1	AGC Filter
C47	1500		R5CC26ZY152M	GP1500M	D6-152	1W5D15	GP2L-0015	1FM-215	AGC Filter
C48	5000		V-5596	BPD-005	DD-502	1D5D5	811-005	29C1	2nd V. IF Screen
C49	1500		R5CC26ZY152M	GP1500M	D6-152	1W5D15	GP2L-0015	1FM-215	2nd V. IF Plate Dec.

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (CONT.)

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA WESTINGHOUSE PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C50	.25	400	V-6066-4254M	P488-25		GT4P25		TC-2	AGC Filter
C51	5000		V-5596	BPD-005	DD-502	1D5D5	811-005	29C1	3rd V. IF Screen
C52	5000		V-5596	BPD-005	DD-502	1D5D5	811-005	29C1	3rd V. IF Cath.
C53	1500		R5CC26ZY152M	GP1500M	D6-152	1W5D15	GP2L-0015	1FM-215	3rd V. IF Dec.
C54	47	500			TCZ-47		NPOM-47		Fixed Trimmer
C55	5000		V-5596	BPD-005	DD-502	1D5D5	811-005	29C1	4th V. IF Cath.
C56	5000		V-5596	BPD-005	DD-502	1D5D5	811-005	29C1	4th V. IF Screen
C57	1500		R5CC26ZY152M	GP1500M	D6-152	1W5D15	GP2L-0015	1FM-215	4th V. IF Decoup.
C58	5000		V-5596	BPD-005	DD-502	1D5D5	811-005	29C1	4th V. IF Fil.
C59	4.7		V-5658-6	GP5K	TCZ-4.7	5W5V5	GP1K-5	MS-55	V Diode Filter
C60	33	500			TCZ-33		NPOL-33		Fixed Trimmer
C61	.25	400	V-6066-4254M	P488-25		GT4P25		TC-2	Video Coupling
C62	.022	400	V-6023-4223K	P488-022	DF-203	PTE4S2		TM-12	Video Coupling
C63	.1	400	V-6023-4104M	P488-1	DF-104	PTE4P1		TM-1	DC Res. Cath. Byp.
C64	4.7		V-5658-6	GP5K	TCZ-4.7	5W5V5	NPOK-4.7	MS-55	S. IF Coupling
C65A	5000		V-9044-1	BPD-2 x 005	DD-2-502	1D5D5	882-2 x 005	36C2	1st S. IF Plate Dec.
B	5000					1D5D5			1st S. IF Screen
C66	5000		V-5596	BPD-005	DD-502	1D5D5	811-005	29C1	1st S. IF Cath.
C67	47	500	RCM20B470K	1468-00005	D6-470	5W5Q5	GP1K-47	1FM-45	2nd S. IF Grid Filter
C68	5000		V-5596	BPD-005	DD-502	1D5D5	811-005	29C1	AVC Filter
C69	100	500		1468-0001	D6-101	5W5T1	GP1K-100	1FM-31	Diode RF Filter
C70	.022	400	V-6023-4223K	P488-022	DF-203	PTE4S2		TM-12	AVC Filter
C71	.01	400	V-6023-4103M	P488-01	D6-103	PTE4S1	811-01	TM-11	2nd S. IF Dec.
C72	680	500	RCM20B681M	1468-00075	D6-681	5W5T7	GP2K-680	MS-37	Diode Load Cap.
C73	.0033	600	V-6023-6202M	P688-0033	D6-332	PTE6D3	GP2M-0033	TM-23	De-emphasis
C74	.01	400	V-6023-4103M	P488-01	D6-103	PTE4S1	811-01	TM-11	Audio Coupling
C75	330	500	V-6023-4103M	1468-00035	D6-331	5W5T3	GP2K-330	1FM-335	Tone Compensation
C76	.05	200	V-6023-4503M	P288-05	DF-503	PTE4S5		TM-15	Tone Compensation
C77	.01	400	V-6023-4103M	P488-01	D6-103	PTE4S1	811-01	TM-11	Audio Coupling
C78	150	500	RCM20B151K	1468-00015	D6-151	5W5T15	GP2K-150	1FM-315	AF Amp. Plate Byp.
C79	.1	400	V-6023-4104M	P488-1	DF-104	PTE4P1		TM-1	AF Amp. Dec.
C80	.022	400	V-6023-4223K	P488-022	DF-203	PTE4S2		TM-12	Audio Coupling
C81	.005	600	V-6023-4472M	P688-005	D6-502	PTE6D5	811-005	TM-25	Output Plate
C82	.25	400	V-6066-4254M	P488-25		GT4P25		TC-2	Sync. Coupling
C83	270	500	RCM20B271K	1468-00025	D6-271	5W5T25	GP2K-270	1FM-325	Sync. Coupling
C84	.01	400	V-6023-4103M	P488-01	D6-101	PTE4S1	811-01	TM-11	Sync. Coupling
C85	.047	400	V-6023-4503M	P488-047	DF-503	PTE4S5		TM-15	Sync. Coupling
C86A	2000		V-9213 *	P688-002	4PC-100 *	PTE6D2	GP2M-002	TM-22	Integrator Net.
B	5000			P688-005		PTE6D5	811-005	TM-25	Integrator Net.
C	5000			P688-005		PTE6D5	811-005	TM-25	Integrator Net.
C87	.047	400	V-6023-4503M	P488-047	DF-503	PTE4S5		TM-15	Vert. MV Cath.
C88	.01	400	V-6023-4103K	P488-01	D6-103	PTE4S1	811-01	TM-11	Vert. MV Feedback
C89	.1	400	V-6023-4104M	P488-1	DF-104	PTE4P1		TM-1	Vert. MV Grid
C90	.068	400	V-6023-4683K	P488-068					Vert. Disch.
C91	.1	400	V-6023-4104M	P488-1	DF-104	PTE4P1		TM-1	Vert. Sweep Coup.
C92	.1	400	V-6023-4104M	P488-1	DF-104	PTE4P1		TM-1	Decoupling
C93	.001	600	V-6023-6102M	P688-001	D6-102	PTE6D1	GP2L-001	TM-21	Hor. Sync. Coupling
C94	.001	600	V-6023-6102M	P688-001	D6-102	PTE6D1	GP2L-001	TM-21	Hor. Sync. Coupling
C95	330	500	RCM20C331J	1469-00035	D6-331	5R5T3	GP2K-330	1FM-335	Hor. Feedback
C96	330	500	RCM20C331J	1469-00035	D6-331	5R5T3	GP2K-330	1FM-335	Hor. Feedback
C97	.001	600	V-6023-6102M	P688-001	D6-102	PTE6D1	GP2L-001	TM-21	Voltage Divider
C98	.005	600	V-6023-4472M	P688-005	D6-502	PTE6D1	811-005	TM-25	AFC Filter
C99	.047	400	V-6023-4503M	P488-047	DF-503	PTE4S5		TM-15	AFC Filter
C100	680	500	RCM20B68K	1479-0007	D6-681	5W5T7	GP2K-680	MS-37	Hor. MV Cath.
C101	330	500	RCM20C331J	1469-00035	D6-331	5R5T3	GP2K-330	MS-33	Hor. MV Feedback
C102	3900	500	RCM33C392K	1464-004		1DR5D4		MS-24	Fixed Trimmer
C103	.1	400	V-6023-4104M	P488-1	DF-104	PTE4P1		TM-1	Hor. MV Dec.
C104	.1	400	V-6023-4104M	P488-1	DF-104	PTE4P1		TM-1	Hor. MV Dec.
C105	.1	400	V-6023-4104M	P488-1	DF-104	PTE4P1		TM-1	Hor. MV Grid
C106	100	500	RCM20B101K	1468-0001	D6-101	5W5T1	GP1K-100	1FM-31	Hor. MV Plate Byp.
C107	680	500	RCM20B681M	1479-0007	D6-681	2R5T7	GP2K-680	MS-37	Hor. Discharge
C108	.01	400	V-6023-4103M	P488-01	D6-103	PTE4S1	811-01	TM-11	Hor. Sweep Coupling
C109	270	500	RCM20B271K	1468-00025	D6-271	5W5T25	GP2K-270	1FM-325	Hor. Grid Bypass
C110	.1	400	V-6023-4104M	P488-1	DF-104	PTE4P1		TM-1	Hor. Output Cath.
C111	.1	400	V-6023-4104M	P488-1	DF-104	PTE4P1		TM-1	Hor. Output Screen
C112	.1	400	V-6023-4104M	P488-1	DF-104	PTE4P1		TM-1	Hor. Output Plate Dec.
C113	.1	400	V-6023-4104M	P488-1	DF-104	PTE4P1		TM-1	Hor. Sweep Coupling
C114	.25	400	V-6066-4254M	P488-25		GT4P25		TC-2	Damper Filter
C115	.1	400	V-6023-4104M	P488-1	DF-104	PTE4P1		TM-1	Decoupling
C116	.05	400	V-6023-4503M	P488-05	DF-503	PTE4S5		TM-15	HV Osc. Plate Dec.
C117	.05	400	V-6023-4503M	P488-05	DF-503	PTE4S5		TM-15	HV Osc. Screen
C118	270	500	RCM20B271K	1468-00025	D6-271	5W5T25	GP2K-270	1FM-325	HV Osc. Grid
C119	500	30K	V-5895	HV20C	TV2-502				HV Filter
C120	500	30K	V-5895	HV20C	TV2-502				HV Filter
C121	.01	600		P688-01	D6-103	PTE6S1	811-01	TM-11	Line Filter
C122	.01	600		P688-01	D6-103	PTE6S1		TM-11	Line Filter

* Items C86A, C86B, C86C, R102A, R102B, and R102C are combined into one unit obtainable under Mfgr's Part No. V-9213-1.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA WESTING. PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	INSTALLATION NOTES
R1A	50KΩ	½	V-9235-2		RTV-56	SBB-513	Brightness control-front
B	1500Ω	½					Contrast control-rear
R2A	500KΩ	½		Concentrikit Bll-133 †			Vert. hold control-front
B	100KΩ	½	V-9233	Bll-128 †	RTV-57	SBB-514	Horiz. hold control-rear
C	Shaft End		E-203 †				Attach per instr. in "Concentrikit".
R3A	Switch		9558-2 †				Magnifier switch-front
B	500KΩ	½					Volume control and switch-rear
R4A	2.5 Meg.	½	V-5909	Qll-239	AG-84-S	AN-83	Magnifier height control
B	Shaft		Not Req.	RQ	FKS-1/4	AK-1	Attach to R4A per instructions
R5A	25KΩ	½	V-5910	Qll-120	AM-40-S	AN-26	Magnifier vert. linearity control
B	Shaft		Not Req.	RQ	FKS-1/4	AK-1	Attach to R5A per instructions
R6A	1 Meg.	½	V-6463	Qll-137	AG-61-S	AN-69	Height control
B	Shaft		Not Req.	RQ	FKS-1/4	AK-1	Attach to R6A per instructions
R7A	5000Ω	½	V-6463	Qll-114	AM-19-S	AN-10	Vert. linearity control
B	Shaft		Not Req.	RQ	FKS-1/4	AK-1	Attach to R7A per instructions
R8	3000Ω	4	V-6500-2		RTV-61	SVP-989	Width control-Wire Wound
R9	400Ω	4	V-5908		RTV-94	VK-126	Focus control-Wire Wound

† Additional parts to be used with "Concentrikit".
† Some models use volume control and switch assembly Part No. V-9607-2.

RESISTORS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA WESTINGHOUSE PART No.	IRC PART No.	IDENTIFICATION CODES ALL RESISTORS ARE ± 10% UNLESS OTHERWISE STATED.
R10	2200Ω	½	RC20AE222K	BTS-2200	RF Amp. Grid -See Note 1
R11	100Ω 20%	½	RC20AE101M		RF Amp. Cathode
R12	2200Ω	½	RC20AE222K	BTS-2200	RF Amp. Decoupling - See note 2.
R13	220KΩ 20%	½	RC20AE224M		Mixer Grid-See Note 3
R14	15KΩ 20%	½	RC20AE153M		Mixer Plate Load
R15	18KΩ 20%	½	RC20AE183M		Osc. Grid-See Note 4
R16	4700Ω	½	RC20AE472K	BTS-4700	Osc. Plate Load
R17	10KΩ 20%	½	RC20AE103M	BTS-10K	AGC Network
R18	1000Ω 20%	½	RC20AE102M	BTS-1000	Decoupling
R19	15Ω 20%	½	RC20AE150M		Parasitic Suppressor
R20	82Ω	½	RC20AE820K		FM-RF Amp. Cathode
R21	10KΩ	2	RC40AE103K	BT-2-10K	FM-RF Amp. Plate Decoupling
R22	470KΩ 20%	½	RC20AE474M	BTS-470K	FM Mixer Grid
R23	1000Ω	½	RC20AE102K	BTS-1000	FM Mixer Decoupling
R24	33Ω	½	RC20AE330K		Parasitic Suppressor
R25	2200Ω	½	RC20AE222K	BTS-2200	AM Ant. Loading
R26	22KΩ	2	RC40AE223K	BTS-22K	AM Conv. Screen Dropping
R27	47KΩ	1	RC30AE473K	BTA-47K	AM Conv. Screen Dropping
R28	15KΩ	½	RC20AE103K	BTS-15K	AM Conv. Plate Decoupling
R29	1.5 Meg. 20%	½	RC20AE155M	BTS-1.5 Meg.	AVC Network
R30	22KΩ	½	RC20AE223K	BTS-22K	Oscillator Grid
R31	12KΩ	½	RC20AE123K	BTS-12K	1st Video IF Grid
R32	100Ω	½	RC20AE101K		1st Video IF Cathode
R33	1000Ω 20%	½	RC20AE102M	BTS-1000	1st Video IF Screen Dropping
R34	1000Ω 20%	½	RC20AE102M	BTS-1000	1st Video IF Plate Decoupling
R35	10KΩ 20%	½	RC20AE103M	BTS-10K	AGC Network
R36	10KΩ 20%	½	RC20AE103M	BTS-10K	AGC Network
R37	8200Ω	½	RC20AE822K		2nd Video IF Transformer Shunt
R38	100Ω	½	RC20AE101K		2nd Video IF Cathode
R39	1000Ω 20%	½	RC20AE102M	BTS-1000	2nd Video IF Screen Dropping
R40	1000Ω 20%	½	RC20AE102M	BTS-1000	2nd Video IF Plate Decoupling
R41	4700Ω	½	RC20AE472K	BTS-4700	3rd Video IF Transformer Shunt
R42	68Ω	½	RC20AE680K		3rd Video IF Cathode
R43	100KΩ	1	RC30AE104K		3rd Video IF Screen Dropping
R44	1000Ω 20%	½	RC20AE102M	BTS-1000	3rd Video IF Plate Decoupling
R45	470KΩ	1	RC30AE474K	BTS-470K	AGC Network
R46	470KΩ	1	RC20AE474K	BTS-470K	AGC Network
R47	100KΩ 20%	½	RC20AE104M	BTS-100K	AGC Network
R48	220KΩ	1	RC20AE224K	BTA-220K	AGC Network
R49	4700Ω	½	RC20AE472K	BTS-4700	4th Video IF Transformer Shunt
R50	68Ω	½	RC20AE680K		4th Video IF Cathode
R51	47KΩ	1	RC30AE473K		4th Video IF Screen Dropping
R52	1000Ω 20%	½	RC20AE102M	BTS-1000	4th Video IF Plate Decoupling
R53	4700Ω	½	RC20AE472K	BTS-4700	Video Detector Diode Load
R54	22KΩ 20%	½	RC20AE223M	BTS-22K	Sync. Coupling
R55	68KΩ	1	RC30AE683K	BTA-68K	Video Output Screen Dropping
R56	22KΩ	½	RC20AE223K	BTS-22K	Peaking Coil Shunt
R57	3600Ω 5%	1	RC30AE362J		Video Output Plate Load
R58	47KΩ	½	RC20AE473K	BTS-47K	Isolation
R59	1 Meg.	½	RC20AE105K	BTS-1 Meg.	DC Restorer Grid
R60	2.2 Meg.	½	RC20AE225K	BTS-2.2 Meg.	Picture Tube Grid
R61	47KΩ	½	RC20AE473K	BTS-47K	Voltage Divider
R62	6800Ω	½	RC20AE682K	BTS-6800	Voltage Divider
R63	47KΩ	½	RC20AE473K	BTS-47K	Voltage Divider
R64	100Ω	½	RC20AE101K		1st Sound IF Cathode
R65	47KΩ	1	RC30AE473K	BTA-47K	1st Sound IF Screen Dropping
R66	5600Ω	1	RC30AE562K	BTA-5600	1st Sound IF Plate Decoupling
R67	100KΩ	½	RC20AE104K	BTS-100K	2nd Sound IF Grid
R68	68KΩ	1	RC30AE683K	BTA-68K	2nd Sound IF Decoupling
R69	1 Meg.	½	RC20AE105K	BTS-1 Meg.	AVC Network
R70	47KΩ	½	RC20AE473K	BTS-47K	Diode RF Filter
R71	2.2 Meg.	½	RC20AE225K	BTS-2.2 Meg.	Diode Load
R72	1 Meg.	½	RC20AE105K	BTS-1 Meg.	AVC Network
R73	100Ω	½	RC20AE101K		Balancing
R74	33KΩ	½	RC20AE333K	BTS-33K	De-emphasis
R75	6800Ω 5%	½	RC20AE682J	BTS-6800-5%	Ratio Detector Diode Load
R76	6800Ω 5%	½	RC20AE682J	BTS-6800-5%	Ratio Detector Diode Load
R77	4700Ω	½	RC20AE472K	BTS-4700	Tone Compensation
R78	10 Meg. 20%	½	RC20AE106M	BTS-10 Meg.	AF Amp. Grid
R79	470KΩ	½	RC20AE474K	BTS-470K	AF Amp. Plate Load
R80	150KΩ	½	RC20AE154K	BTS-150K	AF Amp. Plate Decoupling
R81	1 Meg.	½	RC20AE105K	BTS-1 Meg.	Feedback
R82	33Ω 20%	½	RC20AE330M	BW-½-33	Parasitic Suppressor
R83	220KΩ	2	RC20AE224K	BTS-220K	Output Grid
R84	180Ω	2	RC40AE181K	BW-2-180	Output Cathode
R85	3900Ω	½	RC20AE392K	BTS-3900	Output Screen Dropping
R86	470Ω	4	V-6067-6		Output Decoupling-Wire Wound
R87	1670Ω	10	V-9085-4		Bleeder-Wire Wound
R88	4700Ω	½	RC20AE472K	BTS-4700	AGC Amp. Grid
R89	10KΩ	2	RC40AE103K	BT-2-10K	AGC Amp. Cathode
R90	1800Ω 5%	½	RC20AE182J	BTS-1800-5%	Voltage Divider
R91	1 Meg.	½	RC20AE105K	BTS-1 Meg.	Voltage Divider
R92	470KΩ	½	RC20AE474K	BTS-470K	Charge Limiting
R93	15KΩ	½	RC20AE153K	BTS-15K	Sync. Sep. Plate Load
R94	2.2 Meg.	½	RC20AE225K	BTS-2.2 Meg.	Noise Clipper Diode Load
R95	1 Meg.	½	RC20AE105K	BTS-1 Meg.	Sync. Amp. Grid
R96	150KΩ	½	RC20AE154K	BTS-150K	Sync. Amp. Plate Load
R97	22KΩ	½	RC20AE223K	BTS-22K	Voltage Divider
R98	1 Meg.	½	RC20AE105K	BTS-1 Meg.	Phase Inv. Grid
R99	2700Ω	½	RC20AE272K	BTS-2700	Phase Inv. Cathode
R100	470Ω	½	RC20AE471K	BTS-470	Phase Inv. Cathode
R101	2700Ω	½	RC20AE272K	BTS-2700	Phase Inv. Plate Load
R102A	22KΩ	½			Integrator Network
B	8200Ω	½	•		Integrator Network
C	8200Ω	½			Integrator Network
R103	1000Ω	½	RC20AE102K	BTS-1000	Vert. MV Cathode
R104	100KΩ	½	RC20AE104K	BTS-100K	Vert. MV Plate Load
R105	470KΩ	½	RC20AE474K	BTS-470K	Vert. MV Grid
R106	390KΩ	½	RC20AE394K	BTS-390K	Vert. MV Plate Load
R107	4700Ω	½	RC20AE472K	BTS-4700	Vert. Peaking
R108	47KΩ	½	RC20AE473K	BTS-47K	Decoupling
R109	2.2 Meg.	½	RC20AE225K	BTS-2.2 Meg.	Vert. Output Grid
R110	470Ω	½	RC30AE471K	BTA-470	Vert. Output Cathode
R111	470Ω	1	RC30AE471K	BTA-470	Vert. Output Decoupling
R112	680Ω	10	V-9085-5		Decoupling-Wire Wound
R113	68KΩ	½	RC20AE683K	BTS-68K	Hor. AFC Diode Load

RESISTORS (CONT.)

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA WESTINGHOUSE PART No.	IRC PART No.	IDENTIFICATION CODES
R114	220KΩ	1	RC30AE224K	BTA-220K	Hor. Feedback
R115	220KΩ	1	RC30AE224K	BTA-220K	Hor. Feedback
R116	100KΩ 5%	½	RC20AE104J	BTS-100K-5%	Hor. AFC Diode Load
R117	100KΩ 5%	½	RC20AE104J	BTS-100K-5%	Hor. AFC Diode Load
R118	4.7 Meg. 20%	½	RC20AE475M	BTS-4.7 Meg.	Hor. AFC Diode Load
R119	470KΩ	½	RC20AE474K	BTS-470K	Hor. AFC Filter Network
R120	180Ω	½	RC20AE182K	BTS-1800	Hor. MV Cathode
R121	5600Ω	½	RC20AE562K	BTS-5600	Hor. MV Plate Load
R122	33KΩ	1	RC30AE333K	BTA-33K	Hor. MV Plate Decoupling
R123	220KΩ 5%	½	RC20AE224J	BTS-220K-5%	Hor. MV Grid
R124	220KΩ	½	RC20AE224K	BTS-220K	Hor. MV Plate Load
R125	33KΩ	1	RC30AE333K	BTA-33K	Hor. MV Plate Decoupling
R126	27KΩ	½	RC20AE273K	BTS-27K	Hor. Peaking
R127	100KΩ	½	RC20AE104K	BTS-100K	Hor. Output Grid
R128	150Ω	3	V-6067-4	AB-150	Hor. Output Cathode-Wire Wound
R129	100Ω	½	RC20AE101K		Parasitic Suppressor
R130	100Ω	½	RC20AE101K		Parasitic Suppressor
R131	10KΩ	5	V-6984-3	AB-10K	Hor. Output Screen Dropping-Wire Wound
R132	2KΩ	5	V-6984-1	AB-2000	Damper Filter-Wire Wound
R133	560Ω	5	V-6984-6		Decoupling-Wire Wound
R134	68Ω	½	RC20AE680K	BW-½-68	HV Osc. Plate Decoupling
R135	33KΩ	2	RC40AE333K	BT-2-33K	HV Osc. Screen Dropping-See Note 5
R136	68KΩ	½	RC20AE683K	BTS-68K	HV Osc. Grid
R137	100KΩ	½	RC20AE104K		HV Filter
R138	110Ω	3	V-4758		Focus Coil Shunt-Wire Wound
R139	1000Ω	2	RC40AE102K	BT-2-1000	Focus Coil Shunt
R140	100Ω	½	RC20AE101K		Parasitic Suppressor

Note 1. Some models use 1000Ω resistor in this application.
Note 2. Some models use 4700Ω resistor in this application.
Note 3. Some models use 270KΩ resistor in this application.
Note 4. Some models use 22KΩ resistor in this application.
Note 5. Some models use 68KΩ resistor in this application.
* Items R102A, R102B, R102C, C86A, C86B and C86C are combined into one unit. See C86 for parts listings.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	RATING SEC. 3	REPLACEMENT DATA WESTINGHOUSE PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.
T1	117VAC ② 2.5A	660VCT .300ADC	5VAC ② 6A	12.6VCT ② 6A	V-6988		P-3061	TP-365

TRANSFORMER (FILAMENT)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	RATING SEC. 3	REPLACEMENT DATA WESTINGHOUSE PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.
T2	117VAC ② .1A	6.3VAC ② 1.2A			V-6481-2	P-6134 ②	P-2945 ②	F-633 ②

② Drill one new mounting hole.

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING DC RESISTANCE PRI.	RATING DC RESISTANCE SEC.	REPLACEMENT DATA WESTINGHOUSE PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	NOTES
T3	440Ω		V-9230-2				Hor. Output Choke
T4	650Ω	8.7Ω	V-9584-1	A-8113	A-3036	TSO-5 ②	Vert. Output Trans.
T5A	37Ω		V-6486-4				Hor. Deflection Coil
B	60Ω						Vert. Deflection Coil
T6	240Ω		V-9590-3		MF-1		Focus Coil
T7	2Ω	700Ω	V-9278				HV Trans.
		SEC. 2					
		0Ω					

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING IMPEDANCE PRI.	RATING IMPEDANCE SEC.	RATING DC RES. PRI.	RATING DC RES. SEC.	REPLACEMENT DATA WESTING. PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	INSTALLATION NOTES
T8	2000Ω	4.5Ω	140Ω	.5Ω	V-9685	A-3876 ②	A-3018	RO-2	② Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS FIELD RES.	RATINGS V. C. IMP.	REPLACEMENT DATA WESTINGHOUSE PART No.	JENSEN PART No.	QUAM PART No.	NOTES
SP1	PM	4Ω	V-9335		10A31	
	CONE DIA.	V. C. DIA.				
SP2	9 1/4"	1"				

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D.C. RESISTANCE	RATINGS INDUCTANCE (0 CURRENT 1000 ~)	REPLACEMENT DATA WESTING. PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	INSTALLATION NOTES
L1	.300ADC	41.5Ω	1.4 Henries	V-6471	C-2996 ②	C-2326 ③	TR-3300 ②	② Drill one new mounting hole. ③ Cut off tips of mounting feet and drill new holes as required.

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA		NOTES
		PRI.	SEC.	WESTINGHOUSE PART No.	MEISSNER PART No.	
L2	Ant. Coil	0Ω				Part of tuner #V-8210
L3	Ant. Coil	0Ω				Part of tuner #V-8210
L4	RF Coil	0Ω				Part of tuner #V-8210
L5	Osc. Coil	0Ω				Channel 6, part of tuner #V-8210
L6	Osc. Coil	0Ω				Channel 13, part of tuner #V-8210
L7	Fil. Choke	.5Ω				Part of tuner,#V-8210
L8	1st Video IF	.5Ω				Part of tuner #V-8210
L9	Fil. Choke	.1Ω		V-9099-1		
L10	AM Loop Ant.	3Ω		V-5982-2		
L11	Ant. Loading	1.8Ω		V-6157		
L12	AM Osc.	9.5Ω		V-9352		Tap at .6Ω
L13	Fil. Choke	.1Ω		V-4886-2		
L14	Fil. Choke	.1Ω		V-4886-2		
L15	FM Ant.	0Ω		V-9355		
L16	RF Choke	1.9Ω		V-4886-4		
L17	RF Choke	.1Ω		V-4886-10		
L18	FM Mixer Grid Coil	0Ω		V-9317-2		
L19	FM Osc. Coil	0Ω		V-9353		
L20	Para. Supp.	0Ω		V-4886-7		Wound on 22Ω resistor
L21	2nd Video IF	.9Ω	.9Ω	V-9586-3		
L22	3rd Video IF	.9Ω	.9Ω	V-9586-2		
L23	Fil. Choke	.5Ω		V-9099-1		
L24	4th Video IF	.9Ω	.9Ω	V-9586-2		
L25	Sound Trap	0Ω	0Ω	V-9592		
L26	Fil. Choke	.5Ω		V-9099-1		
L27	5th Video IF	.9Ω	.9Ω	V-9586-3		
L28	Fil. Choke	1.7Ω		V-9099-2		
L29	Peaking	4.7Ω		V-5902-4	19-1920	100 microhenries
L30	Sound Trap	1.9Ω		V-9591		
L31	Peaking	5.7Ω		V-5902-1	19-1921	140 microhenries
L32	Peaking	7.8Ω		V-5902-5	19-1922	250 microhenries
L33	1st TV-FM Sound IF	2.4Ω	2.4Ω	V-9370		
L34	1st AM IF	17Ω	17Ω	V-6130-1		
L35	2nd TV-FM Sound IF	2.4Ω	2.4Ω	V-9371		
L36	2nd AM IF	17Ω	17Ω	V-6130-2		
L37	Fil. Choke	.5Ω		V-9099-1		
L38	Ratio Det. Trans.	5.6Ω	.8Ω	V-9340		
L39	Fil. Choke	.5Ω		V-9099-1		
L40	Ringing Coil	100Ω		V-6764		
L41	RF Choke	16Ω		V-9279-1		

PHONO CARTRIDGE and NEEDLE

ITEM No.	REPLACEMENT DATA					REMARKS
	WESTINGHOUSE PART No.	ASTATIC PART No.		SHURE PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M1		ACD-J	A-1 A-3	W22AB	A62A A65MG	

ASTATIC AND SHURE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED.

DIAL LIGHTS

ITEM No.	BASE TYPE	VOLTS	AMPS.	BEAD COLOR	REPLACEMENT DATA WESTINGHOUSE PART No.	NOTES
M2	Bayonet	6-8	.25	Blue	W#44	Type #44

MISCELLANEOUS

ITEM No.	PART NAME	WESTINGHOUSE PART No.	NOTES
M3	RF Tuner	V-8210	Alternate part #V-9502-1
M4	Switch	V-9618	Function, Phono-AM-FM-TV-UHF
M5	Ion Trap	V-6573-4	
M6	Tuning Cap.	V-9349-2	
	Trimmer	V-6454	HV Osc.
	Safety Glass	V-9536-2	Mahogany cabinet
	Safety Glass	V-9536-3	Blonde cabinet
	Cabinet	V-1202-1	Mahogany
	Cabinet	V-1202-2	Blonde
	Dial	V-9316	AM-FM
	Knob	V-6284-7	Channel selector, mahogany
	Knob	V-6284-9	Channel selector, blonde
	Knob	V-6284-2	Function switch, mahogany
	Knob	V-6284-3	Function switch, blonde
	Knob	V-6146-1	Contrast, volume, Horiz. hold, mahogany
	Knob	V-6146-6	Contrast, volume, Horiz. hold, blonde
	Knob	V-9731-1	TV antenna, mahogany
	Knob	V-9731-2	TV antenna, blonde
	Knob	V-9104-1	Brightness, Vert. hold
	Knob	V-9471-1	Picture expander
	Knob	V-9104-2	AM-FM tuning
	Knob	V-9104-4	Fine tuning

HORIZONTAL RINGING COIL ADJUSTMENT

Turn the receiver on and tune in a TV station, preferably a test pattern.

Trun the magnifier switch to the "magnified" position (clockwise).

Turn the horizontal hold control to the mid-position of its range.

Adjust the horizontal ringing coil slug (B1) until the picture synchronizes horizontally.

HORIZONTAL WIDTH ADJUSTMENT

Turn the magnifier switch to the "magnified" position (clockwise) and adjust the horizontal hold control until the picture synchronizes horizontally.

Turn the magnifier switch to the "normal' position (counterclockwise) and without touching the horizontal hold control turn the width control until the picture synchronizes and is of proper width.

VERTICAL HEIGHT AND LINEARITY ADJUSTMENTS

Turn the magnifier switch to the "normal' position (counterclockwise).

Adjsut the height control and the vertical linearity control until the picture is of proper height and is symmetrical from top to bottom.

These two controls are interacting and will require alternate adjustment to obtain proper results.

Turn the magnifier switch to the "magnified" position (clockwise).

Adjust the vertical linearity magnifier control and the height magnifier control alternately until the picture is symmetrical from left to right.

Each time the "normal" height and linearity controls are changed, the magnified controls will require adjustment.

HIGH VOLTAGE OSCILLATOR ADJUSTMENT

Turn off the receiver and disconnect the high voltage lead from the picture tube.

Connect 18 one megohm, one watt, resistors in series from the high voltage lead to chassis.

Connect the high voltage multiplier probe of a VTVM to the high voltage lead and connect the commom lead to chassis.

Turn the receiver on and adjust the high voltage oscillator trimmer (B2) until the meter reads approximately 9.3KV.

ZENITH MODELS
S14022, S14024, S14025, S14027

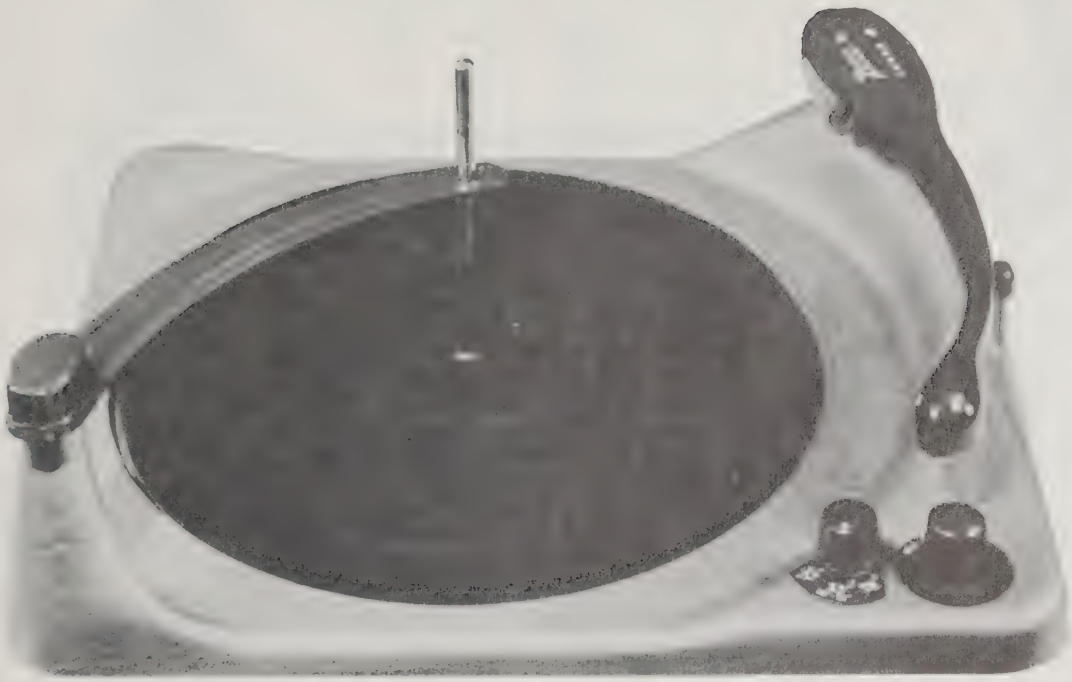


Figure 1

GENERAL INFORMATION

The Zenith Models S-14022, S-14024, S-14025 and S-14027, intermix record changers, are designed to play standard 78 RPM, 45 RPM and 33-1/3 RPM records of standard commercial dimensions. With a few minor exceptions, these four changers are alike, both electrically and mechanically. Models S-14022 and S-14024 have a solenoid reject mechanism. S-14022 has a 6-wire cable and socket, and the S-14025 has a 9-wire cable and socket. Models S-14025 and S-14027 do not have the solenoid trip mechanism and they have separate phono and AC cables. The only difference between these two changers is the lead length. Features of these changers include playing and automatically changing as many as ten 12" or twelve 10" records. Ten-inch and twelve-inch records of the same type can be intermixed, either standard (78 RPM) or long play (33-1/3 RPM).

A full stack of ten 7", 33-1/3 RPM records, or a full stack of ten 7", 45 RPM records (with the adapter inserted in the record) will also play on this changer. The changer shuts off after the last record has been played.

Connect this changer only to an outlet supplying 117 volts, 60-cycle, AC, unless otherwise specified. Power consumption: 25 watts.

Manufactured by:

Zenith Radio Corporation
6001 Dickens Avenue
Chicago 39, Illinois

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HOWARD W. SAMS & CO., INC., INDIANAPOLIS, INDIANA

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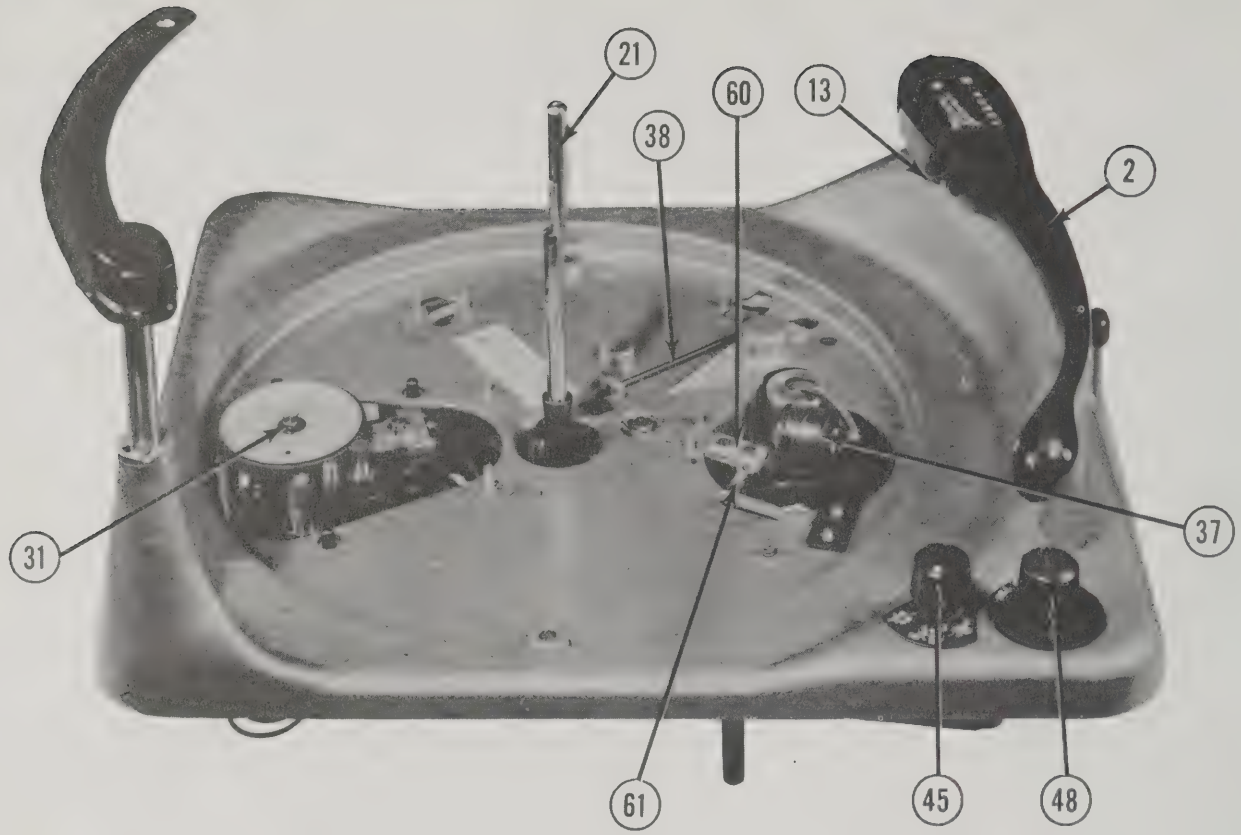


Figure 2

OPERATING INSTRUCTIONS

Shipping Bolts -

Before placing the record changer in operation, the machine must be floated freely on the mounting springs. During shipping, the mechanism is secured by means of the two shipping bolts. To float the changer, remove the turntable by lifting it straight up the spindle and turn out the two red-stained record changer mounting bolts. (Retain these two bolts in case of reshipment of the changer.) When replacing the turntable, be certain to push back trip dog (84) and gently push back the idler wheel (31) while slowly lowering the turntable and turning it in a counterclockwise direction. This is extremely important so that the turntable will not damage the trip dog or idler wheel.

Leveling Record Changer -

It is essential to have the record changer absolutely level. Use a torpedo or similar type level on the record changer baseplate. Use adequate shims to level the record changer pan or radio combination cabinet to achieve perfect level.

Loading the Record Changer -

1. Pull straight up on record support knob (1A) until record support clears spindle. Swing record support to the left until pin in shaft drops into locating groove.

2. Changer will automatically play ten 12", either standard or long-play, twelve 10", either standard or long-play, any assortment of ten 12" and 10" records intermixed, or ten 7", long-play or fine-groove, records.

NOTE: Standard and long-play records cannot be played in same stack of records. Motor speed control knob must be reset for each type of recording.

3. Place records on spindle and lower to offset shelf. Hold records level and replace record support (1) over spindle.

To Play Standard 78 RPM Recordings -

1. Motor speed control knob must be in the "78" position.

2. To start, turn changer control knob to "Rej." and release. Changer will operate automatically until the last record has been played. The pickup arm then returns to rest and the control knob automatically moves to "Off" position as the changer automatically stops.

To Play Long-Play (33-1/3 RPM) Records -

1. Motor speed control knob must be in the 33-10"-12" position for 10" or 12", long-play, 33-1/3 RPM records, or in the 33-7" position for 7", long-play, 33-1/3 RPM records.

To Play Fine-Groove (45 RPM) Records -

1. Motor speed control knob must be in the "45" position for 7", fine-groove, 45 RPM records.

However, these records are manufactured with a 1-1/2" spindle hole, so it is essential that a record adapter be inserted into each 45 RPM record to be played. This is necessary to reduce the spindle hole to the conventional size.

Rejecting -

To reject a record at any time while changer is operating, turn changer control knob to "Rej." and release.

Stopping -

To turn off changer before automatic shut off, turn changer control knob to "Off." (NOTE: Do not stop changer during cycle.) Lift pickup arm and place on rest.

Unloading -

Lift the record support and swing to left until pin on shaft drops into locating groove. Lift stack of records straight off spindle.

MANUAL OPERATION

To play single records or home recordings, lift up the record-support arm and move it to left, clear of the turntable. Place record on spindle and lower to spindle shelf. Tilt record down toward the rear of pickup arm and lower record to turntable. Turn changer control knob to "On" position, and trip index trigger on inside rear of pickup arm. Raise pickup arm and place the needle in lead-in groove of record.

Repeating of 7", 10" or 12" Records -

To repeat, place record on the turntable, (do not place the record support over the spindle), start changer. Record repeats until control is turned to "Off." If a 12" record is repeated, wait for the changer to finish cycling and reposition the pickup arm, manually, to the 12" position.

CAUTION: When changing needles, be certain that only a red-green cartridge is used, S-15780. This will accommodate 78, 45, and 33-1/3 RPM records.

This changer is provided with what is commonly known as a velocity trip rather than a ratchet and positive trip mechanism. A velocity trip depends, for the tripping action, on the rate of forward motion of the pickup arm with respect to the turntable rotation. The changer will trip only when the pickup arm advances more in one revolution of the turntable than the distance between normal grooves in a record. Only records having fast-finishing grooves before the eccentric cycling groove will operate the velocity trip. During the normal playing cycle, the trip pawl (84) is contacted with a wiping action by a small projection on the turntable hub. This repeated action prevents the trip pawl from engaging the projection while the pickup arm moves slowly toward the spindle.

A stud on the locator housing (56) contacts the trip link (75) when the pickup arm nears the end of a record. The end of the trip link nearest the spindle contacts the trip lever and turns it as the pickup arm advances. The trip lever, through spring washer tension, turns the trip pawl. Small motions of the trip pawl are not sufficient to cycle the mechanism because, on each revolution of the turntable, the wiping contact by the hub projection moves the trip pawl back to clear the projection.

In the first revolution of the turntable, during which the pickup arm advances rapidly, the trip pawl is moved far enough for the sharp point at the end to definitely engage the projection on the turntable hub, thereby turning the cam to start the change cycle.

THEORY OF THE COBRA RADIONIC PICKUP

The operation of the Cobra pickup is considerably different from Crystal and Dynamic pickups. These pickups generate audio power, while the Cobra controls power generated by a radio frequency oscillator, detector and audio amplifier. The oscillator operates at a frequency of 2.5 Mc. Modulation is accomplished by changing the energy losses in tuned circuit. These losses may be represented by an equivalent resistance in series with the reactance of the coil. The ratio of the resistance to the reactance determines the efficiency of "Q" of the coil. The amplitude of the RF voltage developed across this coil by an oscillator will vary with changes in "Q."

The grid coil L1 and other components of the oscillator are mounted in the oscillator pre-amp. chassis, while the plate coil L2 is in the needle cartridge with the vane and needle assembly. The coil is fixed and has 40 turns of No. 40 wire (approximate DC resistance 2-1/2 ohms). The stainless-steel vane, which is in the field of the coil, is spot-welded to the osmium-iridium tipped stylus.

Any movement of the stylus will cause a corresponding movement of the vane. As the stylus and vane follow the modulations in the record, changes in the mutual inductance between the vane and the coil occur (see Figure 4). In position 2, the vane is at rest, and a constant RF voltage appears across the plate coil. As the vane is set in motion and reaches position 1, it is at its greatest outward swing from the coil, resulting in low mutual inductance, low reflected resistance, higher "Q," and a higher RF voltage across the coil. In position 3, it is at its greatest inward swing, resulting in a high mutual inductance, high reflected resistance, lower "Q," and a lower RF voltage. It can be seen that the amplitude of the RF voltage, which appears across the coil, will vary with changes in "Q," satisfying the condition for amplitude modulation.

The position of the vane changes both the "Q" and "L" of the coil. Changes in "L" shift the frequency slightly, and a certain amount of frequency modulation is present, but since there is no frequency discrimination, it remains undetected.

Since the grid and plate coils are part of a single-tuned circuit, any variations of amplitude of the RF voltage, brought about by the changes in "Q" across the plate coil, will also appear across the grid coil L1, causing a shift in the average plate current through the plate load resistor across which the audio output voltage is developed. Plate bend detection takes place since only the positive half of the grid swing causes an increase in the average plate current. These changes in the average plate current appear as audio voltage across the plate load resistor.

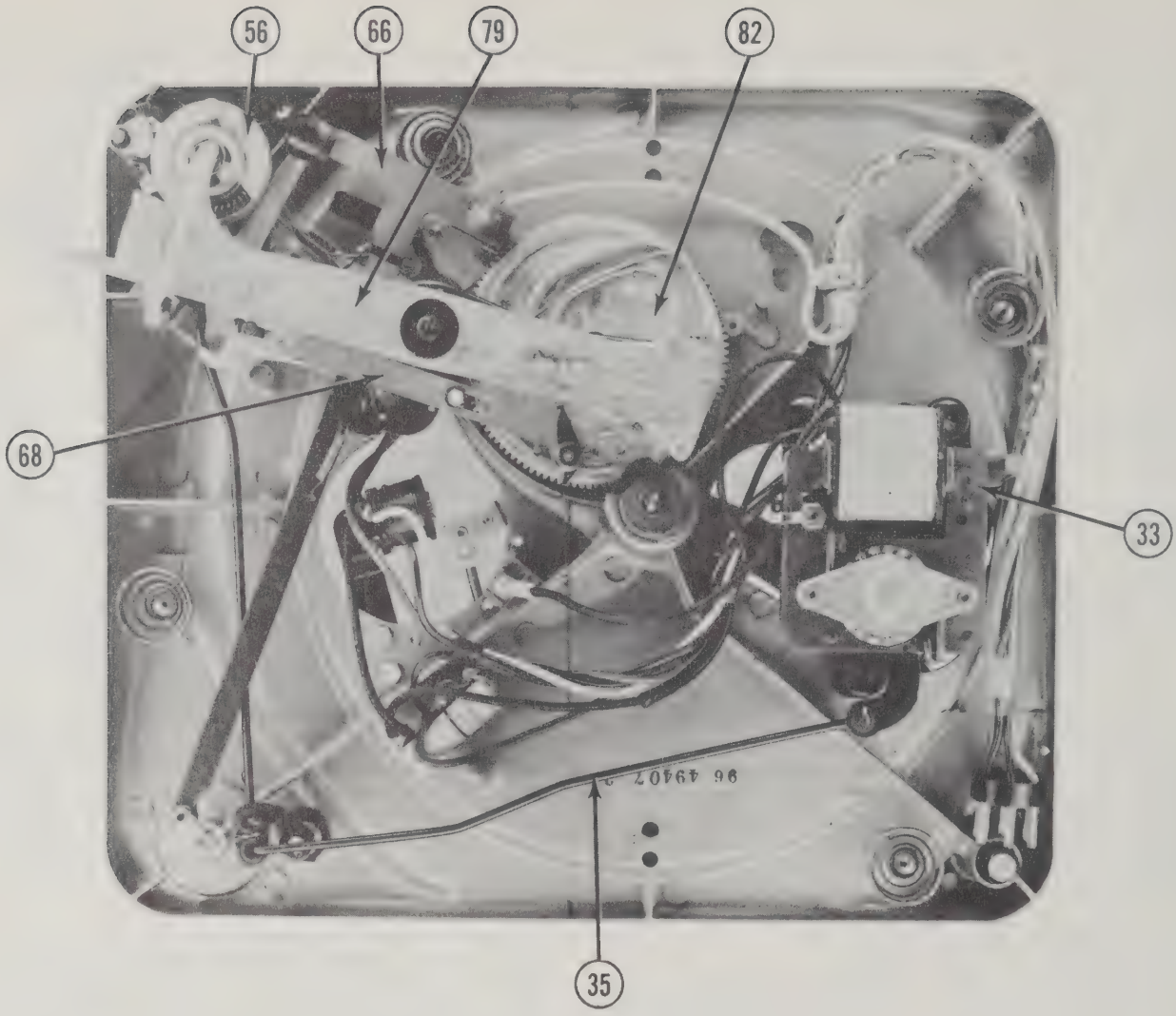


Figure 3

The 2.5 Mc. RF voltage and the audio voltage both appear at the plate (pin 6) of the oscillator triode. R2, C4, and C5 filter out the RF voltage, allowing only the audio component to the grid (pin 4) of the amplifier triode where it is amplified, fed through a shielded lead to the audio amplifier of the receiver and reproduced by the loudspeaker.

MOTOR DRIVE MECHANISM

The 3-speed drive mechanism operates in a very simple manner. When the speed-control lever is turned to 78 RPM position, idler wheel (31) is driven directly from the phono-motor shaft. When the speed -control lever is turned to 33-1/3 position, the entire bushing assembly is rotated in a counterclockwise direction. This removes the phono-motor shaft from the idler wheel and instead places the right-hand 33-1/3 RPM speed-reduction bushing in contact with the idler wheel. The phono-motor shaft, through the media of a rubber drive belt, then drives the 33-1/3 speed reduction bushing which, in turn, drives the idler wheel. When the speed-control lever is turned to 45 RPM position, the entire bushing assembly turns clockwise. The 45 RPM speed-reduction bushing is then in contact with the idler wheel. The phono-motor shaft, through the media of a rubber drive belt, then drives the 45 RPM speed-reduction bushing, which, in turn, drives the idler wheel.

LUBRICATION

Additional lubrication should not be required for the life of the changer, but in cases of unusual use, or high-operating temperature, the changer should be lubricated as follows (refer to the exploded view):

Apply Lubriplate (Stay-Put Grease):

1. Hinge bearing (17).

2. Locator housing (56) and set-down locator plate (65).

3. Cam faces on lift arm (79), lift arm bearing and lift arm cutoff rod bearings.

4. Between lever spring (70) and cutoff rod (69).

5. Heart-shaped cam track on cam (82) and cam bearing.

6. Spindle between roller plunger and roller spring housing and the spindle body.

7. Turntable ball bearing.

8. Pickup arm locator assembly bearing (52)

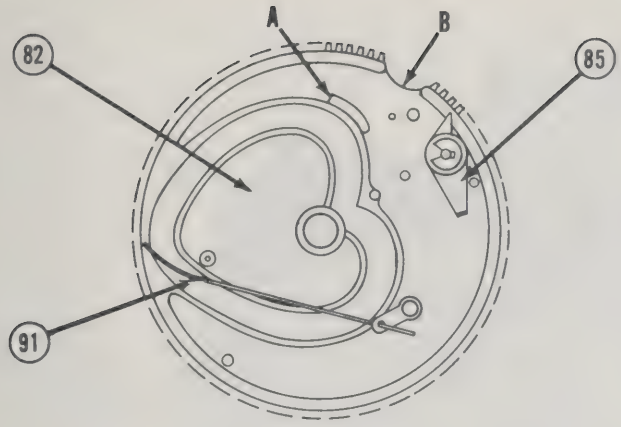


Figure 4

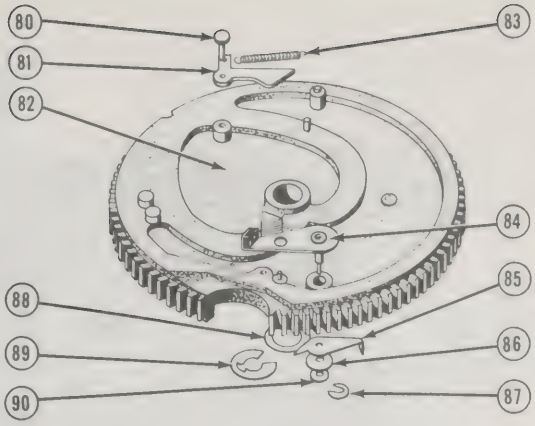


Figure 5

and ball bearing in pickup arm post.

9. Control-lever bearing (39).

10. Turntable and spindle bearing.

ADJUSTMENTS

Needle Set-Down. (Refer to the Exploded View) -

The set-down position on the needle is adjusted by means of the two adjusting screws (8). If the needle is setting down too far out on the record, loosen the back screw about 1/4 turn and tighten the front screw to lock the adjustment in place. If the needle is setting down too far in on the record, loosen the front screw and tighten the back screw. When correct set-down is obtained for the 10" position, the 12" and the 7" needle set-down will also be correct.

Pickup Arm Height. (Refer to the Exploded View) -

The pickup arm height is adjusted by the screw (15) located on top of the pickup arm lift rod (58). Turn the screw out or in until the underneath side of the pickup arm clears the rest by 1/8" to 3/16".

Needle Pressure -

The pickup arm needle pressure should be between 6 and 8 grams. If the pressure is in excess of 8 grams, the drilled end of the hinge bracket (14A) should be bent back away from the hinge bearing assembly (17).

NOTE: A very slight bend of this bracket will cause considerable change in the pressure. If the pressure is less than 6 grams, correction may be made by bending the drilled end of the hinge bracket forward in the direction of the hinged bearing assembly.

In no case should the needle pressure be less than 6 grams. If this pressure is lower than 6 grams, the needle will not track in the record grooves. This may be recognized by "skidding" of the pickup arm across the record and by failure of the changer to cycle at the end of the record. Improper tracking may be due to other causes (see heading "Needle Does not Track Across Record Properly"). An accurate scale, calibrated in grams, must be used in checking this needle pressure.

TROUBLES

Control Knob (48) Cannot Be Turned to "On" Position -

1. Machine has been shut off during cycle.

   (a) Turn the turntable clockwise, by hand, until the control knob (48) is free.

Turntable (20) Does not Revolve When Control Knob (48) Is Turned to "On" Position -

1. Machine stalled in cycle.

   (a) Turn the turntable clockwise, by hand, until it starts rotating under its own power.

2. No current at motor (33).

   (a) Check to determine if current is reaching AC leads of changer.

   (b) Check the switch (62) to determine if it is closing.

   (c) Check wiring and soldered terminals in the changer.

3. Motor (33) defective.

   (a) Remove turntable to allow motor to operate without load. If current is reaching motor and pulley does not rotate, the motor is defective. Repair or replace.

4. Motor idler wheel (31) not engaging turntable rim.

   (a) If motor pulley is turning but turntable is not:

      (1) Check motor idler assembly to determine if it is free to contact the motor pulley and the turntable.

      (2) Wipe off the inside rim on the turntable to remove flock, or if oily, clean the turntable rim and rubber tire of the idler wheel (31), shown in exploded view, with alcohol.

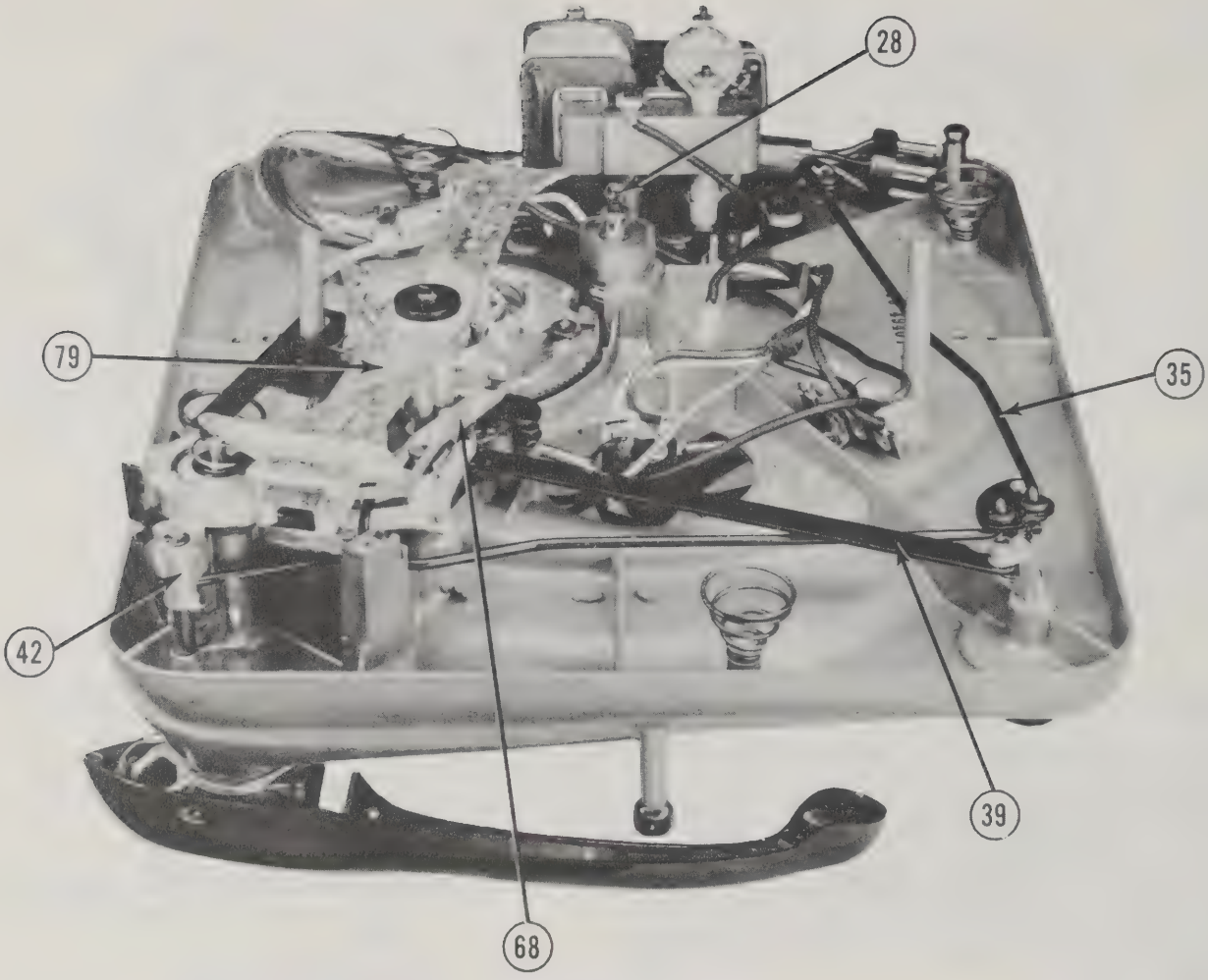


Figure 6

5. Oil on belts and pulley.

   (a) Clean with alcohol.

   (b) Replace belt and pulley.

Changer Does not Cycle When the Control Knob Is Turned to the "Rej." Position. (Refer to the Exploded View.) -

1. The manual reject not actuating the trip.

   (a) Turn the control knob (48) to the reject position, hold, and see if the reject link (38) on the control lever (39) is contacting the trip pawl (84) on the main cam (82). This should actuate the trip pawl (84) to engage with pinion gear on the turntable hub. When the trip rod (38) is pushed and the cam pawl (84) on the main gear, Figure 4, does not move forward, engaging the teeth on the turntable hub, check for binding between the cam pawl (84) and the cam. If binding occurs, clean out all foreign matter and check for freedom. Relubricate between cam pawl and cam with #DC4 Grease. Do not use an excessive amount.

On Models S-14022 and S-14024 Changer Does not Cycle When Reject Button on Front Panel Is Depressed -

1. Solenoid winding open.

   (a) Solenoid winding open. Check with ohmeter for continuity.

Record Does not Drop When Changer Cycles. (Refer to Figure 2 and Exploded View) -

1. Spindle pusher shaft broken.

   (a) If the pusher shaft (inside the spindle) is broken, the roller assembly (28) will drop out of the spindle. Loosen the spindle holding set screws and remove the spindle assembly (21). Replace with a new spindle unit.

2. Pusher in spindle not moving far enough forward to eject a record.

   (a) The pusher (23) should move up inside the spindle body, then move forward until it has reached a point flush with, or a maximum of .010" beyond the spindle body. To assure that the pusher is all the way forward, the spindle

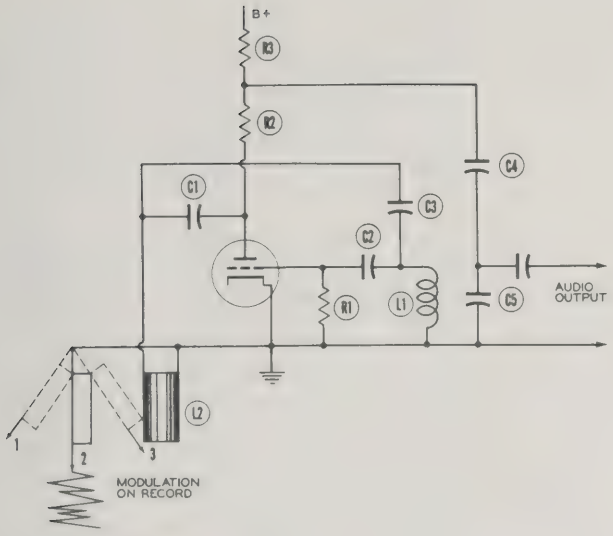


Figure 7

roller, part of the pusher and roller assembly (28), should be raised high enough by the lift arm (79), at the top of the cam face, to slightly compress the roller spring inside the pusher housing (see "Turntable Stalls During Cycle").

If the roller is compressed and the pusher (23) does not move far enough forward to eject a record, the spindle should be replaced. If a record is not pushed completely off the ledge, it may hang up on the spindle momentarily, then drop on the pickup arm when it moves in over the turntable.

3. Lift screw loose.

   (a) Check screw (74) to determine if it is turned all the way in.

4. Pusher raises outside spindle body.

   (a) When the changer cycles, the pusher (23) should first rise inside the spindle body, then move forward inside the center hole in the record. If the pusher rises outside the spindle body, it will raise the record instead of pushing it off the spindle ledge. Remove the spindle and replace with a complete new spindle assembly.

5. Lift arm roller broken off.

   (a) If the lift arm roller (78) is broken off, the lift arm (79) will not turn when the cam revolves. Replace lift arm assembly (79).

Two Records Drop at Once.
(Refer to the Exploded View and Figure 2.) -

1. Hole in record too large.

   (a) Check the diameter of the hole in the record. An oversized hole will cause two records to drop at once.

2. Spindle Slide not fully down.

   (a) If spindle slide is not all the way down, more than one record may be dropped at a time.

   (b) Check the spindle slide (22) to be sure it is free and does not bind at any point. Clean out foreign matter, or straighten if necessary. Do not oil.

   (c) When records are placed on the spindle, be sure the spindle slide (22) is all the way down. The spindle slide (22) will normally raise slightly as a record is being dropped, but it should return to place immediately.

3. Record support binding on spindle, or bent out of square with the shaft.

   (a) The record support (1) must be able to slide freely, by gravity, down the spindle, if the support does not follow the records down as they are being ejected. If binding occurs, two or more records may be ejected at once.

   (b) Check the spindle (21) to determine if it is straight. If necessary, bend carefully with fingers.

   (c) Straighten the record support (1) if it is not square with the record support shaft.

   (d) If the hole in the record support (1) is not centered over the spindle after checking (b) and (c), bend the support shaft on the baseplate until the hole in the record support is centered over the spindle.

   (e) When the pin in the record support shaft has just entered the slot in the record support shaft post on the baseplate, the play in the record support, as it is swung from one side to the other, should be equal on both sides of the spindle. To correct bent condition, hold the support shaft and carefully force the record support into the proper position. If the support is loose on the shaft, remove the knob and restake with hammer and punch.

4. Record pusher defective.

   (a) The record pusher (23) may be deformed, etc. This may cause two records to drop at once. Replace with a new spindle assembly (21).

Record Hits Pickup Arm.
(Refer to the Exploded View) -

1. Pusher in spindle not moving far enough to eject record.

   (a) (See "Record Does not Drop When Changer Cycles" -2).

2. Lift-arm screw loose.

(a) Tighten lift-arm screw (74).

3. Pusher extending beyond outside diameter of spindle.

(a) Replace spindle (21).

4. Pickup arm not adjusted properly.

(a) The adjustment procedure for the needle set-down point is given under "Adjustments." If the hinge bearing (17) has been removed, or the hinge bearing set screw (16) has been loosened, the relationship between the hinge bearing and the pickup arm locator assembly (52) must be reset. To make the proper adjustments, proceed as follows:

(1) Allow changer to shut off automatically before removing tone arm.

(2) Loosen the set screw (16) sufficiently to allow the hinge bearing to slide on the pickup arm locator assembly shaft. The set screw may be adjusted with an Allen wrench through the hole in the adjusting ring (7) located between the two adjusting screws (8).

(3) Place a 1/32" shim, or .032 diameter music wire, between the set-down locator (65) and the locator housing (56).

The shim, or music wire, must clear detents on (65) and (56).

(4) Raise the pickup arm and rotate the hinge assembly counterclockwise as far as it will go. In this position, the arm extending from the set-down locator should be engaged by the turned down leg on the control lever (39).

(5) Take up all the play between the parts and shim by pressing up on the bottom of the locator housing and down on the top of the hinge bearing. Align detents on (65) and (56).

(6) Tighten the hinge body set screw (16) and remove the shim.

Needle Does not Set Down on 10" Record in Proper Position. (Refer to the Exploded View.) -

1. Pickup arm not adjusted properly.

(a) See "Record Hits Pickup Arm" - 4)

2. Hinge catch (10) does not return to 10" record position when changer cycles.

(a) Stop the machine in mid-cycle when the lift-arm (79) has moved as far out as it will go and is about to move back to its starting position. Lift the pickup arm and see if there is a gap of at least 1/64" between the end of the leg on the catch (10) and outside step on the adjusting ring (7). The catch should be free to allow it to be pulled forward against the stop at the end of the leg on the adjusting ring. If there is not enough gap, check the setting of the hinge body and the pickup arm locator (see "Record Hits Pickup Arm" - 4).

If the setting is incorrect, the cam face on the lift arm (79), which contacts the round stud on the bottom of the locator housing should be forced around far enough to bring the pickup arm out until the stop on the bottom of the hinge casting meets the stop in the baseplate. Then, to assure that the pickup arm is out as far as it will go, the lift arm should move the locator housing a few degrees farther around, which will slightly compress the safety spring (54) and hold the pickup arm out firmly against the stop.

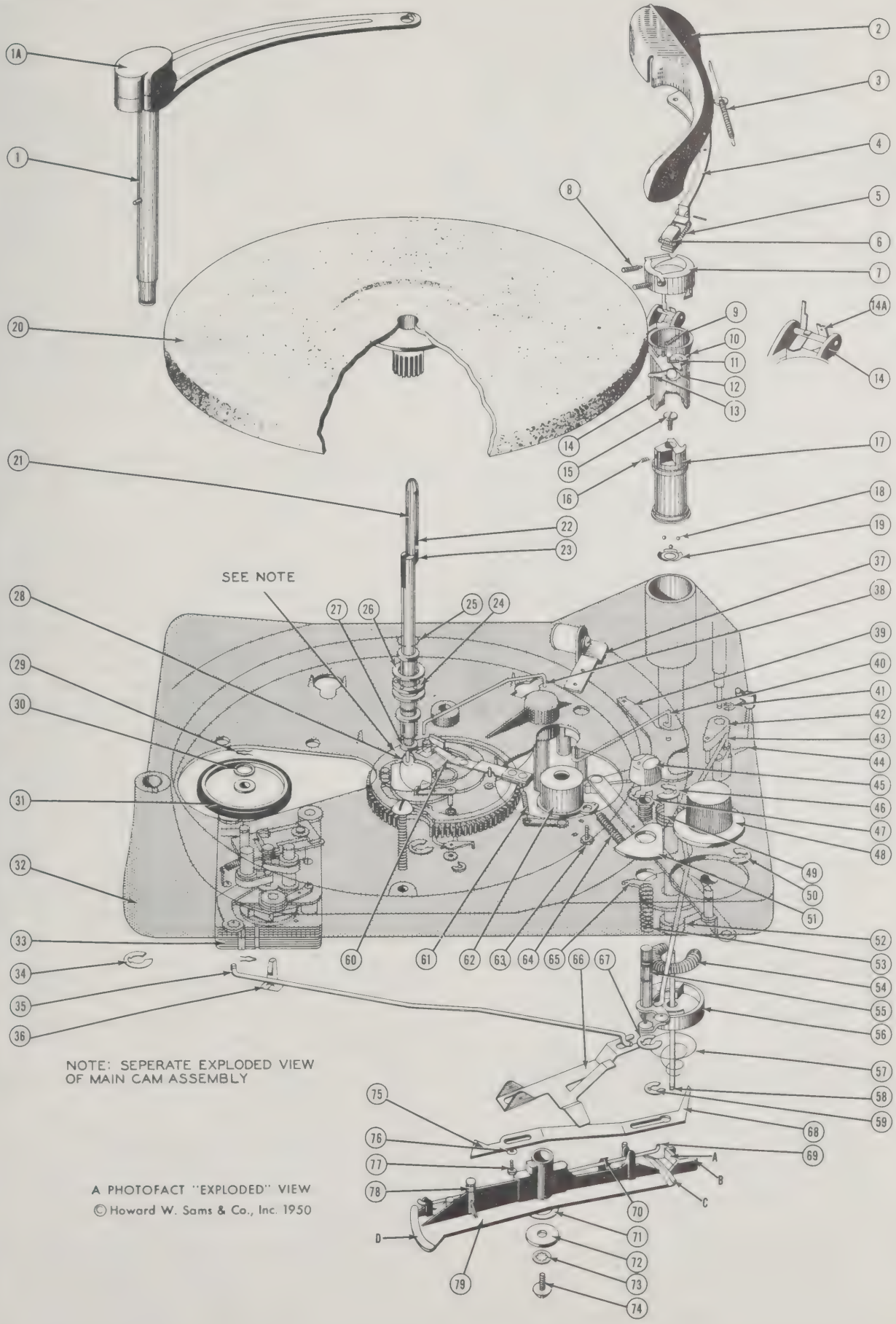
(b) Lubricate the hinge bearing with Stay-Put Grease. Do not use heavy grease. If the bearing between the hinge bearing and hinge body binds, the safety spring will compress instead of bringing the hinge body around firmly against the stop.

3. Binding between safety spring and locator housing.

(a) If the safety spring (54) binds against the locator housing, and does not hold the casting on the bottom of the pickup arm locator assembly (52) against the stop inside the locator housing, irregular needle set-down will result. Disassemble the pickup arm locator assembly (52) by removing the lift arm (79) and loosening the hinge bearing set screw (16). Then pull the locator housing and pickup arm locator assemblies down from the bottom of the changer.

Hold the pickup arm locator shaft in one hand, turn the locator housing assembly to slightly compress the safety spring, release, and see if the safety spring returns the pickup locator casting firmly against the stop surface of the locator housing assembly. If binding occurs, remove the safety spring to see if the pickup arm locator casting turns freely in the locator housing casting. Remove burrs or sharp edge on end of safety spring, stretch safety spring a little to increase tension, and replace.

(b) Check to see if the locator plate (65) is meshing with the locator housing when the lift rod (58) is positioned at the beginning of the sloping cam surface (C) of the lift arm (79) in the final stage of the cycle. To test the meshing of the locator plate and the locator housing, swing the pickup arm half way in toward the spindle. If the locator plate and locator housing disengage when in the



NOTE: SEPERATE EXPLODED VIEW OF MAIN CAM ASSEMBLY

A PHOTOFACT "EXPLODED" VIEW

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above position, it is necessary to reset the clearance between the locator plate and the locator housing (see "Record Hits Pickup Arm"). Also, it may be necessary to file off any burrs which may be present on the mating surfaces of the locator plate and the locator housing.

4. Hinge catch does not disengage from the hinge cam.

(a) When the index lever (13) has been depressed, it is held in the position until the catch (10) is disengaged (see "Needle Does not Set Down on 12" Record in Proper Position" - 6). When the cycle is completed, if the catch does not disengage from the hinge cam (12):

(1) Check to determine if the leg on the catch (10) is sliding down the incline on the left of the adjusting ring (7).

(2) The catch (10) and the hinge cam (12) are not disengaging when the catch leg is resting on the inside step on the adjusting ring. If this occurs, file the edge of the catch which contacts the hinge cam until the two parts have a clearance between them of about 1/64" when the leg on the catch is on the inside step on the adjusting ring.

5. Tone arm will not set down on record after the changer has shut off automatically.

(a) The long tail of locator plate (65) may be bent. Straighten with pliers.

Needle Does not Set Down on 12" Record in Proper Position. (Refer to the Exploded View.)-

1. Diameter of 12" record undersize.

(a) The set-down position of the needle for 12" records is determined by the edge of the record striking the index lever (13). If a 12" record has a diameter of less than the standard size of 11-7/8", plus or minus 1/32", it may fail to depress the trip lever far enough.

2. Enlarged center hole in record.

(a) An enlarged center hole might fail to set the trip lever because it could produce the same effect as a small record.

3. Pickup arm not adjusted properly.

(a) (See "Record Hits Pickup Arm" - 4)

4. Binding between safety spring and locator housing.

(a) (See "Needle Does not Set Down on 10" Record in Proper Position" -3).

5. Index lever does not cock when 12" record drops.

(a) Allow a 12" record to drop to the turntable and stop the changer just after it falls, before the pickup arm has a chance to move in over the record. The index lever should be forced down until the step on the hinge cam (12) passes the edge of the catch (10), preventing the hinge cam and the index lever from returning to their original position. If the trip lever does not stay down in a depressed position:

(1) Check the catch (10) to see if it is free to move forward and engage the hinge cam.

(2) If the stop on the bottom of the hinge body (14) is bent, it might allow the pickup arm to move too far out, thus moving the index finger away from the spindle. This would produce the same effect as an undersize record. Item (14) should then be replaced.

6. Hinge catch does not go into inside step on adjusting ring when index lever is depressed.

(a) When the index lever (13) is tripped by a falling 12" record, the leg on the catch (10) should be moved out over the incline between the inside and outside steps on the adjusting ring leg and held in that position by the shoulder on the hinge cam (11) until the pickup arm starts to move in over the record. When this occurs, the leg on the catch should contact the incline and be moved out as it slides down the incline until the catch (10) is disengaged and the index lever (13) can snap back up to a horizontal position. If the leg on the catch is not moved out far enough to enable it to slide down incline, file about a 1/16" chamfer on the edge of the catch leg (10) which contacts the incline. Check for binding between hinge body (14) and hinge bearing (17). Burrs on the bearing surfaces, or lack of lubrication, may prevent the hinge bearing from turning freely.

Needle Does not Track Across Record Properly -

1. Needle may be clogged by accumulation of lint, dirt, etc., or sapphire tip may be chipped.

(a) Clean foreign material from around needle.

(b) Check needle to see if the tip is bent or broken. Replace needle.

2. Locator housing does not disengage from the set-down locator when a cycle is completed.

(a) There should be a 1/32" gap between the locator housing and the set-down locator when the machine is not in cycle. If the gap is small enough to allow the parts to touch and bind as the needle moves across the record, the

RED
PHONO MOTOR
TONE ARM
BLK
P2
S-14025
C1
.047
R1
680
ON-OFF SWITCH
P1
RED
PHONO MOTOR
TONE ARM
BLK
BLK
P2
S-14027
OFF-ON SWITCH
P1
WH SPEC. PICKUP
TONE ARM
S.P.S.T. SWITCH
C1
R1
047 680
PHONO MOTOR
SI
ELECTRO MAGNET
R2
100
S-14022
BL
BLK
BR
YEL
P3
S.P.S.T. SWITCH
C1
R1
047 680
PHONO MOTOR
TONE ARM
WH SPEC. PICKUP
SI
ELECTRO MAGNET
R2
100
S-14024
BL
BLK
BR
YEL
P4

hinge bearing must be reset (see "Record Hits Pickup Arm" - 4).

3. Hinge bearing binds.

(a) Place a block under the back end of the pickup arm to prevent the needle from touching the turntable. With sensitive gram scale, check the amount of force required to move the pickup arm across the turntable. The force required should not exceed 3 grams. If the pressure required is excessive:

(1) Check the locator housing and set-down locator for binding (see 2, above).

(2) Check the bearings (18) in the pickup arm post for binding. The bearing is located below the hinge bearing (17). To inspect it, loosen the set screw (16) in the hinge bearing. Unsolder the pickup leads and pull them out. Pull up on the hinge and pickup assemblies. Clean foreign matter or corrosion from the bearings (18); lubricate with light mineral oil.

(To reset position, see "Record Hits Pickup Arm" - 4).

4. Changer not level.

(a) (See "Leveling Record Changer During Long Play" under "General Information.")

5. Excessive vibration while playing an LP record.

(a) Any vibration caused by (1) unsteady mounting, (2) floor vibration, or (3) passing of heavy vehicles may cause the pickup to glide across the record grooves.

Changer Trips Before Needle Reaches End of Record -

1. Hole in record too large.

(a) If the hole in record is too large, the groove may turn eccentric with the spindle and cause premature tripping.

2. Binding of trip link.

(a) With the trip link (75) released, check the trip link for freedom of motion. It should be free to move without binding.

Changer Does not Cycle When Record Has Been Played -

1. No eccentric trip or fast-spiralled groove on record.

(a) All standard records made today have a finishing groove, but some records made in the past did not have this groove. When records of this type are being played, the control knob must be turned to "Rej." at the end of the record.

2. Needle jumps out of grooves in record.

(a) Check trip pressure - the lateral friction of tone arm should not exceed 3 grams. (If the pressure is excessive, see "Changer Trips Before Needle Reaches End of Record," and "Needle Does not Track Across Record Properly.") Suspend the pickup approximately 2" to 5" above the record changer. Using a gram scale, measure the amount of horizontal pull on the pickup arm after the arm has become engaged with the locator trip assembly.

(b) The record may be defective. The finishing groove is often too shallow. Check with a record which is known to be good.

(c) The needle point may be damaged or affected by an excessive accumulation of dust, lint, etc. Check needle pressure as described under "Adjustments."

(d) There may be binding in the pickup bearing or locator housing. (See 1 and 2 - "Needle Does not Track Across Record Properly.")

3. Trip pawl binding on cam face.

(a) The trip pawl (84) must be free to move forward and engage the teeth of the turntable hub when the trip link (75) pushes it. Do not oil; lubricate with DC-4 grease. (See "Changer Does not Cycle When the Control Knob Is Turned to "Rej." Position.")

Tone Arm Hits Records on Spindle When it Raises, or Hits Tone Arm Rest When Arm Moves Out -

1. Tone arm height not adjusted properly.

(a) (See instructions for adjusting the tone arm height under "Adjustments.")

Turntable Speed too Slow (Refer to the Exploded View) -

1. Binding in turntable bearing.

(a) Check the turntable bearing for freedom. Hold the motor idler wheel (31) out of engagement with the turntable and spin the turntable, by hand, to see if it turns readily and coasts for a long time. If binding occurs, remove turntable, foreign matter, and lubricate with light mineral oil.

2. Motor bearings bind.

(a) Lubricate with oil.

3. Line voltage too low.

(a) The line voltage should not be less than

105 volts or the turntable may turn too slowly.

4. Operating temperature too low.

   (a) If the machine has been stored in a cold place, or operated in surroundings at a temperature of less than 60° F., the turntable speed may be too slow.

Turntable Stalls During Cycle (Refer to the Exploded View) -

1. Motor idler not engaging turntable.

   (a) (See "Turntable Does not Revolve When Control Knob Is Turned to "On" Position" -4.)

2. Turntable bearing tight.

   (a) (See "Turntable Does not Revolve When Control Knob Is Turned to "On" Position" - 5.)

3. Operating temperature too low.

   (a) (See "Turntable Speed too Slow" - 4.)

4. Line Voltage too low.

   (a) The line voltage should not be less than 105 volts.

5. Binding in drive mechanism.

   (a) Remove lift arm (79) and hold idler (31) away from turntable, or remove idler wheel. Cycle machine, turning turntable slowly, by hand. The cam should turn freely for the complete revolution without binding at any point. If binding occurs, check for foreign matter in the gear teeth, a bent cam bearing or bent spindle bushing.

   (b) Replace lift arm, loosen spindle set screw and raise spindle high enough to clear the lift arm cam when the machine cycles. Hold the tone arm lift rod (58) up so the end of the lift rod does not contact the lift arm cam. Cycle the machine by hand. The entire cycle should be free without binding at any point. If binding occurs, check the lift-arm bearing for freedom, and the lift-arm roller to be sure it is not bent causing binding in the cam track.

6. Binding between tone-arm lift rod and lift-arm cam face.

   (a) Cycle machine, stopping it half way through the cycle just as the lift arm is about to return. Lift tone arm and raise lift rod (58) by pulling up on the adjusting screw (15) as high as it will go. Feel the lift arm (79) for play. The lift rod may still touch the lift-arm cam face, but it should not bind. If binding occurs, the lift-arm bearing may be bent or the fibre washer (71) under the lift arm should be removed to lower the lift arm.

7. Spindle roller spring compressed too far.

   (a) Cycle the changer and watch the relationship between the bottom of the pusher housing (part of pusher and roller assembly) (27) and the roller (28). Just before the top of the lift-arm cam is reached, the pusher housing should stop its upward motion and the roller should continue up .005" to .047" more, slightly compressing the roller spring. If the spring compresses to much, the

   If the spring compresses too much, the changer may stall on the shut-off cycle.

   (1) If the roller spring is being compressed too much, remove the fibre washer (71) between the lift arm and the steel washer.

8. Motor weak.

   (a) In cases where everything checks all right, but the changer still stalls in cycle, the motor may be weak. Replace motor.

Changer Continues to Cycle -

1. Reject spring (64) loose.

   (a) Make certain that the reject spring (64) is secured in position at both ends.

2. Locator spring (83) loose.

   (a) Check the cam locator spring (83) to make certain it has not fallen off or has become unfastened at either end.

3. Reject rod (38) frozen.

   (a) Make certain that the reject rod (38) is not frozen in the reject position.

4. Trip pawl (84) binding.

   (a) Check the trip pawl (84) on the main cam (82), Figure 5, to make certain it does not bind and that it is free of all foreign matter. (See "Changer Does not Cycle When the Control Knob Is Turned to "Rej." Position.")

Noise During Playing of Record -

1. Rumble from motor.

   (a) If a low-pitched rumbling sound comes from the loud speaker while a record is being played, check the motor grommets to be sure the motor is freely suspended on them. The motor lead wires should have slack to allow the motor to float.

2. Defective turntable bearings.

   (a) Defective turntable bearings (24) can cause rumble. Check for foreign matter

in the bearings, defective balls, binding between balls and ball retainer; rough surface on washers. Clean ball bearings, sleeve bearing and washers; lubricate with lubriplate or light mineral oil.

3. Defective motor idler wheel (31).

   (a) A rapid thumping sound, while the motor is running, may indicate a flat spot on the motor idler wheel (31). If this condition does not clear up after ten minutes of running time, remove the turntable and check the rubber tire on the idler wheel. If the surface of the rubber tire is not smooth and even, replace the idler. Should the bearing of the idler wheel show signs of excessive wear, or be extremely wobbly, the idler wheel should be replaced.

4. Defective record.

   (a) Worn or defective records cause needle scratch and distortion of the recorded sound. If the record is warped, it may slip on the other records causing "Wow," a waver in the recorded sound. An enlarged hole in the record can also cause "Wow."

5. Turntable scrapes.

   (a) If a scraping sound occurs as the turntable revolves, check:

      (1) Turntable warped, causing turntable to rise and fall.

      (2) Motor idler or mounting plate bent.

      (3) Wires beneath turntable rubbing.

6. Squeaks.

   (a) Squeaking sound, as changer operates, indicates lack of oil. Lubricate points indicated under "Lubrication" - thin layer of vaseline on spindle.

Distortion of Recorded Sound -

1. Defective record.

   (a) (See 3 - "Noise During Playing of Record").

2. Defective phono-oscillator.

   (a) Check phono-oscillator, amplifier, and speaker.

No Sound During Playing -

1. Defective cartridge.

   (a) Replace.

2. Defective amplifier.

   (a) Check phonograph amplifier and speaker.

Excessive Record Wear -

1. Binding in tone arm.

   (a) (See 1 and 2 - "Needle Does not Track Across Record Properly")

Changer Does not Shut off After Last Record Has Been Played. (Refer to the Exploded View) -

1. Record support binding on spindle.

   (a) The record support (1) must rest on the offset shoulder of the spindle or the changer will not shut off. (See 3 - "Two Records Drop at Once.")

2. Cut-off rod (69) not engaging shoulder pusher housing.

   (a) On the shut-off cycle, the end of the cut-off rod (69) should contact the shoulder on the bottom of the spindle pusher housing, part of the pusher and roller assembly (27), and turn the cut-off rod over 90°. If the end of the cut-off rod passes under the pusher housing as the machine cycles on the shut-off cycle, check:

      (1) The record support, to be sure it is resting on the spindle. (See 1, above.)

      (2) The spindle, to see if it is being held in place by the spindle set screws.

      (3) The lift-arm screw (74), to be sure it is tight.

Changer Shuts off Prematurely (Refer to the Exploded View) -

1. Spindle roller spring compressed too far.

   (a) (See 7 - "Turntable Stalls During Cycle.")

2. Roller spring in spindle too weak.

   (a) When the bottom record of a stack of 12" records is being rejected from the spindle ledge, the roller spring (in the housing) should not compress until just before the roller reaches the top of the cam incline on the lift arm. If the roller spring is compressed under the load of a full stack of records, it may cause premature shut-off. Replace with a complete spindle assembly (21).

3. Record too thick.

   (a) The changer is designed to play standard records. If an old-style 1/8" thick record is used, the changer will shut off instead of dropping the record.

4. Cut-off rod not being reset.

   (a) After the shut-off cycle, when the cut-off rod (69) has been turned to throw

the switch to the "Off" position, it should be returned to its original position, the next time the machine cycles, by the bent-up end of the cut-off rod contacting the round stud on one leg of the control lever (39). The flat spring (70), acting against the cut-off rod, should throw the rod against its stop on the lift-arm (79) and hold it there. If the cut-off rod is not fully turned, the bent-up end next to the spindle may stick up high enough to prematurely contact the shoulder on the pusher housing, part of pusher and roller assembly (27).

(1) Check the lever spring (70) for tension. Remove and bend slightly to increase tension, if necessary.

(2) Lubricate the cut-off rod bearings, and around the lever spring, with Stayput grease or light mineral oil.

(3) Check the clearance between the end of the cut-off rod (69) which passes under the control lever. When the cut-off rod is in its normal operating position, it should not clear the bottom of the round stud by more than enough to completely turn the end of the cut-off rod vertical position back to a horizontal position.

Turntable Continues to Rotate When Control Knob Is Turned to "Off" Position -

1. Switch defective.

   (a) Check switch for defect and replace if necessary.

Needle Does not Set Down on 7" Record in Proper Position -

1. Tail on set-down locator plate (65) damaged or bent out of position.

   (a) Straighten or replace.

Ref. No.	Part No.	Description
1	VM1799N	Record Support Assembly (Complete)
1A	VM1711K	Knob (Used on VM1799N)
2	148-117	Tone Arm Shell (Only)
3		Needle Pressure Spring (Part of Item 4)
4	VM3093	Socket and Strengthener Assembly
5		Pickup Socket Tension Spring (Part of Item 4)
6		Needle Cartridge Socket (Part of Item 4)
7	VM1840	Adjusting Ring Assembly
8	VM1580	Adjusting Screw (2 Used)
9	VM1574	Adjusting Ring Assembly Spring
10		Catch (Part of Item 14)
11		Spring Catch (Part of Item 14)
12		Index Cam (Part of Item 14)
13		Index Lever (Part of Item 14)
14	VM2043	Complete Hinge Assembly
15	VM1616B	Set-Down Height Adjusting Screw
16	VM1610	Set Screw
17	VM1512	Hinge Bearing
18	VM724	Ball Bearing 1/8" Diameter (6 Used)
19	VM3059	Bearing Spacer (for VM724 Bearings)
20	VM2885A	Turntable Assembly (Complete)
21	VM3114	Spindle and Bearing Assembly (Complete)
22	VM1687	Spring Guide (Part of Item 21)
23		Record Pusher (Part of Item 21)
24	VM2624	Bearing
25	VM2078	Retaining Ring
26	VM2639	Turntable Washer
27		Roller Spring Housing (Part of Item 21)
28		Spindle Roller (Part of Item 21)
29	21914	Hairpin Clip
30	21844	Fibre Washer
31	61125	Idler Wheel
32	VM3092	Base Plate Assembly
33	VM2727C	Phono Motor Only
34	VM2110	"C" Washer for VM1799N
35	VM2823	Index Rod
36	VM1685	Motor Fasteners (3 Used)
*37	S-13913	Solenoid Assembly
38	VM2764	Reject Rod
39	VM2425	Control Lever Assembly (Complete)
40		Reject Rod (Part of Item 38)
41	VM1588	"C" Washer
42	VM1581	Index Cam
43	VM2643	Index Lever
44	VM2661	Hairpin Clip
45	VM2198K	Speed Knob
46		"C" Washer
47	VM2354	Speed Control Shaft Bearing
48	VM2054K	Reject-On-Off Control Knob
49	VM1631	Locator Spring
50	VM1652	"C" Washer for Control Crank
51	VM3091	Speed Escutcheon
52	VM1522	Set-Down Locator Assembly
53		Control Shaft Spring
54	VM1638	Safety Spring (Used on VM1522)
55	VM2824	Speed-Control Crank
56	VM2891	Locator Housing and Lift-Rod Assembly
57	VM1620	Conical Spring (Used on VM1513)
58	VM1513	Lift-Rod Assembly
59	VM1650	"C" Washer (Lift Rod)
*60	VM3016	Armature Bracket Assembly
*61	VM3006	Armature Return Spring
62	VM1519	A. C. Switch (Only)
63		Screw No. 6 x 1/4" Type Z
64	VM1721	Reject Spring
65	VM2648	Set-Down Locator Plate
66	VM3240	Shut-Off Bracket
67		"C" Washer
68	VM2790	Trip Link (Same as 75)
69	VM1595	Cut-Off Rod
70	VM1599	Cut-Off Rod Tension Spring
71	VM1637	Fibre Washer (1/64" Thick)
72	VM1922	Fibre Washer (3/64" Thick)
73		Internal Tooth Lockwasher
74		Screw No. 8-32 x 3/8"
75	VM2790	Trip Link (Same as 68)
76		Flat Washer
77	VM2275	No. 4 x 1/2 Hex Screw
78		Lift Arm Roller (Part of Item 79)
79	VM2887	Lift Arm Assembly (Complete)
80		Rivet
81	VM2789	Cam Locator
82	VM2796	Cam Gear Assembly
83	VM419	Spring (Cam Assembly)
84	VM2795	Trip Pawl Assembly
85	VM2760	Trip Lever
86	VM2516	Spring Washer
87	VM1588	"C" Washer
88	VM1653	Fibre Washer
89	VM1651	"C" Washer for Main Cam
90	VM2829	Fibre Washer
91	VM2388	Wire Spring (Cam Assembly)

* Denotes parts used on S-14024 and S-14022 only. Parts not marked, as above, are common to all Changers.